

**The 4th Joint Meeting
of the
American Association
of Clinical Anatomists
and the
British Association
of Clinical Anatomists**



**July 20-22, 2005
New York City, NY**



jointly sponsored by



**Albert Einstein College of Medicine
and
Weill Medical College at Cornell University**

About the Cover Illustration

Three New York City landmarks are depicted in the cover illustration. Starting on the left, the **Statue of Liberty**, in the center is the **Chrysler Building** and on the right, the **Empire State Building**.

The *Statue of Liberty* is located on 12-acre Liberty Island in New York Harbor - a gift of international friendship from the people of France to the people of the United States. It is one of the most universal symbols representing political freedom and democracy. The Statue of Liberty, dedicated on October 28, 1886, was designated a National Monument on October 15, 1924. The Statue was extensively restored in time for her spectacular centennial on July 4, 1986.

The **Chrysler Building** was one of the first uses of stainless steel over a large exposed building surface. The decorative treatment of the masonry walls below changes with every set-back and includes story-high basket-weave designs, radiator-cap gargoyles, and a band of abstract automobiles. The lobby is a modernistic composition of African marble and chrome steel. Architect William Van Alen designed the building for Walter P. Chrysler, who wanted a provocative building which would not merely scrape the sky but positively pierce it. Its 77 floors briefly made it the highest building in the world - until the Empire State Building was completed. It is still considered a star of the New York skyline, thanks to its crowning peak.

The **Empire State Building**, designed by Shreve, Lamb and Harmon has 102 floors and is 1252 feet high. Construction began on March 17, 1930 with the framework rising at the rate of 4.5 stories per week. President Herbert Hoover officially opened the building on May 1, 1931. It was the tallest building in the world when it was completed, surpassing the Chrysler Building. It was subsequently eclipsed in 1975 by the opening of the World Trade Center towers. Though designed at the end of the so-called art deco period in the 1920s, when zigzagged appliques were prominent, its exterior of Indiana limestone and granite, trimmed with aluminum and chrome-nickel steel from the 6th floor to the top, shows little evidence of this.

**The
American Association
of
Clinical Anatomists**



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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**The
British Association
of
Clinical Anatomists**



The British Association of Clinical Anatomists (BACA) was established on the 7th July 1977 in the United Kingdom to advance the study and research into Clinical Anatomy for the public benefit.

BACA Officers

President

Mr. Alan Moulton, FRCS
Department of Orthopaedic Surgery
The Kings Mill Centre for Health Care Services

Honorary Secretary

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University of East Anglia

Honorary Treasurer

Dr. Peter H. Dangerfield
Department of Human Anatomy and Cell Biology
The University of Liverpool

Clinical Anatomy

Official Journal of the
American Association of Clinical Anatomists
and the
British Association of Clinical Anatomists

Editor-in-Chief - Stephen W. Carmichael
AACA Co-Editors – Anne M.R. Agur, Mark F. Seifert, and
Robert J. Spinner

BACA Editor – Stuart McDonald

Founding Editors: Ralph Ger and Ray J. Scothorne

Editorial Board - 2005

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Annual Banquet

Thursday July 21st, 2005

Presentation of AACAC *Honored Member Award*
to

Ian Whitmore, MD, MB BS

Salon A/B and Financial Center Ballroom
Marriott Financial Center Hotel
New York, NY

6:30 pm - Reception (hosted bar)

7:00 pm – Dinner and presentation of *Honored Member Award*

Reception and Dinner sponsored by *Wiley-Liss*
Wine at banquet tables provided by *Elsevier*

The conference registration fee paid by attendees includes the cost of the Scientific Program and the Banquet. The spouse or guest of a registrant is welcome to attend the banquet. Additional tickets are available at a cost of \$65.

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

* deceased

Honored Member, 2005



The American Association of Clinical Anatomists

recognizes and awards
Honored Membership to

Ian Whitmore, MD, MB BS, LRCP, MRCS

Educator • Statesman • Clinical Anatomist

For his distinguished career in, and enthusiasm for, clinically-relevant anatomy and particularly in recognition of his work in chairing FICAT and making *Terminologia Anatomica* a reality.

Awarded at the 4th Joint AACCA/BACA Meeting in New York City,
July 21st 2005.

Career Development Committee Symposium

Tuesday, July 19th 2:00-4:00 p.m., Salon A/B – 3rd floor

“Teaching strategies for the clinical years: what works and what doesn’t”

Learn how to design senior electives and postgraduate courses, involve clinicians, teach a “specialty” course without being a specialist, etc. A symposium/open forum for “new” and “seasoned” medical educators to share experiences and concerns.

Symposium Speakers

Development of a new clinical anatomy course - issues, inspirations and ideas. Ann Zumwalt Ph.D., Duke University Medical Center.

Designing review courses in surgical anatomy. Thomas Gest Ph.D., University of Michigan Medical School.

Attracting clinicians to participate in upper level anatomy programs. William Swartz Ph.D., Louisiana State University.

Designing clinical anatomy programs for residents. Anne Gilroy M.A., University of Massachusetts Medical Center.

The Mentor Program Social

4:00-5:00 p.m., Salon A/B – 3rd floor

The 2005 Keith L. Moore/Lippincott, Williams & Wilkins Presidential Speaker

“Craniopagus twins: a historical approach to the anatomical separation of conjoined twins”.

James T. Goodrich, M.D.,



Dr. James T. Goodrich did his undergraduate work at the University of California, Irvine and completed his graduate work at the Graduate School of Arts and Sciences of Columbia University receiving a Masters and Doctorate of Philosophy. He received his Doctorate of Medicine from Columbia University College of Physicians and Surgeons. Intern and residency training was completed at the Presbyterian Hospital in the City of New York and the New York Neurological Institute. Dr. Goodrich presently is director of the Division of Pediatric Neurosurgery at the Children's Hospital of Montefiore and holds the academic rank of Professor of Clinical Neurological Surgery, Pediatrics, Plastic and Reconstructive Surgery at the Albert Einstein College of Medicine. He also holds the Rank of Professor Contralto of Neurological Surgery at the University of Palermo in Palermo, Italy. Dr. Goodrich was recently awarded a Doctorate of Science (Honoris Causa) by the College of Mount St. Vincent, Riverdale, New York. Dr. Goodrich and the team at the Children's Hospital of Montefiore received the "Mayor's Award in Science and Technology" given at City Hall, New York City by Mayor Bloomberg and the New York Academy of Sciences for the work on the formerly conjoined Aguirre twins.

Educational Affairs Committee Symposium

Sponsored by **ICON Learning Systems**
Co-sponsored by the American Association of Anatomists
and the National Science Foundation – Project SCORE

Thursday, July 21, 2004 from 3:15 - 5:15 p.m.

"The role of medical health science institutes in preK-12 Outreach Programs".

Rustin E. Reeves, Ph.D., Co-chair. *Human anatomy: The perfect tool for stimulating K-12 teachers' and students' curiosity about science.* Assistant Professor, Director, Project SCORE, Department of Cell Biology and Genetics, University of North Texas Health Science Center, Fort Worth, TX.

E. Robert Burns, Ph.D., Co-chair. *Fifteen years of experience in PreK-12 health science outreach.* Professor, Director of UAMS K-12 Partners in Health Sciences Program, Department of Neurobiology and Developmental Sciences, University of Arkansas for Medical Sciences, Little Rock, AR.

Margaret H. Cooper, Ph.D. *Adventures in Medicine and Science (AIMS), a Youth Community Outreach Program.* Professor, Center for Anatomical Science Education, Saint Louis University School of Medicine, St. Louis, MO.

Linda Durham, *Teaching Embryological Development and Health Education to High School, Pre-Professional, and Professional Students, and the Public.* Administrator, Willd Body Program, Loma Linda University, Loma Linda, CA.

Samuel C. Silverstein, M.D., *Impact of Teacher Participation in Science Work Experience Programs on Interest and Achievement of their Students in Science.* Professor, Department of Physiology and Cellular Biophysics, and Professor of Medicine, Columbia University School of Medicine, New York, NY.

A. Hal Strelnick, M.D., *Bronx Science Education Partnership.* Chief, Division of Community Health, Director, Institute of Community and Collaborative Health, Director, Hispanic Center of Excellence, Clinical Professor, Department of Family and Social Medicine, Assistant Professor, Department of Epidemiology and Population Health, Albert Einstein College of Medicine, Bronx, NY.



Educational Affairs Committee Seminar Presentation

"Engage Me or Enrage Me": Educating Today's "Digital Native" Learners.



All educators are struggling to find ways to get today's learners more involved in their learning. The key is not curriculum, certification or testing, but rather ENGAGEMENT. This generation is NOT in need of better content, but of more engaging approaches, more understanding, and 21st century skills. To best help today's unengaged students learn, we need to provide them with learning in a form that motivates them, and the first place to look for help is where they are already engaged the most – in their games. This presentation will show specifically how games engage, and how educators can employ and benefit from not only existing games but also the powerful educational principles behind them.

Marc Prensky is an internationally acclaimed speaker, writer, consultant, futurist, visionary and inventor in the critical areas of education and learning. His professional focus has been on reinventing the learning process, combining the motivation of video games and other highly engaging activities with the driest content of education and business. He is considered one of the world's leading experts on the connection between games and learning. His innovative combination of educational tools and game technology – including the world's first fast-action videogame-based corporate training tool – is being accepted throughout schools, government and corporate America. His programs are considered to be the most advanced and engaging technology for education, business training and e-Learning. His presentations inspire audiences by opening up their minds to new ideas and approaches to technology and education.

Also, please join Marc and others for
"Breakfast with the Experts"
Friday, July 22nd, 2005 from 7:00-8:00 AM
Salon A/B, 3rd floor

Tuesday, July 19th

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 **Salon C – 3rd floor**. As of June 21st the following exhibitors will be in attendance.

A.D.A.M. Inc. (also provided meeting totebags)

Bacus Laboratories

Bone Clones

Carolina Biological

Edu Technology

Elsevier

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Icon Learning Systems

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4th Joint Meeting of the American and British Associations of Clinical Anatomy

July 20-23, 2005
Marriott Financial Center Hotel
New York, NY

Pre-Conference Activities

Tuesday, July 19th, 2005

8:00 a.m. - 9:30 a.m. **Journal Committee Meeting** - (members of
Journal Committee) - *Empire Room, 3rd
floor*

1:00 p.m. - 8:00 p.m. **Registration/Check-In,** *Salon/Ballroom
Foyer – 3rd floor*

Tuesday, July 19th

- 9:30 a.m. - 5:00 p.m. **ACA Council Meeting** - (ACA Officers and Councilors) *Treasury Boardroom, 2nd floor*
- 2:00 p.m. - 4:00 p.m. **Career Development Committee Symposium: "Teaching strategies for the clinical years: what works and what doesn't"**, *Salon/Ballroom A/B – 3rd floor*
- 2:00 p.m. **Set-up for Commercial Exhibitors**, *Salon/Ballroom C – 3rd floor*
- 4:00 - 5:00 p.m. **Mentor Program Social Event**, *Salon/Ballroom A/B – 3rd floor*
- 6:00 - 8:00 p.m. **The Netter's Welcome Reception*** (for all meeting attendees and accompanying persons) – *Financial Center Ballroom – 2nd floor*. *Sponsored by *Icon Learning Systems*

Scientific Session

Wednesday, July 20th, 2005

- 7:00 - 8:45 a.m. **Editorial Board Breakfast Meeting for Editors/ Associate Editors of *Clinical Anatomy*, Wiley Headquarters, 111 River Street, Hoboken, New Jersey.**
- 7:00 - 8:00 a.m. **Career Development Committee SIG meeting**
Empire Room, 3rd Floor.
- 7:30 - 4:00 p.m. **Registration - Salon/Ballroom Foyer – 3rd floor**
Commercial Exhibits – Salon/Ballroom C – 3rd floor
- 9:00 a.m. **Accompanying Persons' Program departs hotel**
- 8:00-8:30 a.m. **Opening Ceremonies /Remarks: Salon/Ballroom A/B – 3rd floor**

Wednesday, July 20th

Carol E.H. Scott-Connor, M.D., Ph.D.
AACA President, University of Iowa

Mr. Alan Moulton, FRCS
BACA President, Orthopaedic Surgery,
The Kings Mill Centre for Health Care Services

Dominick P. Purpura, M.D.
The Marilyn and Stanley M. Katz Dean
Albert Einstein College of Medicine

Carol Storey-Johnson, M.D.
Senior Associate Dean (Education)
Weill Medical College of Cornell University

9:00 a.m.- 4:30 p.m. **Poster Session 1** – Extremities, Head & Neck,
Back, Pelvis & Perineum – *Financial Center
Ballroom – 2nd floor*

All posters listed for this session will be on display **throughout Wednesday**, 9:00 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*.

* indicates is eligible for the *Sandy C. Marks, Jr. Student Poster Presentation Award*.

- 01** Course of specialisation in clinical anatomy of neck and shoulder. **DE CARO, Raffaele**, Ian G. PARKIN, Andreas WEIGLEIN, Teresa VAZQUEZ, Veronica MACCHI*, Jose SANUDO. Department of Human Anatomy and Physiology, Section of Anatomy, University of Padova, ITALY, (1) Department of Human Anatomy and Embryology I. Complutense University of Madrid, SPAIN, (2) Department of Anatomy, Cambridge University, UK, (3) Institute of Anatomy, Medical University Graz, AUSTRIA.
- 02** Bilateral persistent median arteries: case study and literature review. **DOWNIE, Sherry A.**, Mayra RODRIGUEZ*, Inga GUREVICH*, Matthew D. RECKER*, Russell S. WHELAN*, Allen B. YEROUSHALMI*, and Todd

- R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 03** Multiple vascular anomalies in the right femoral triangle: case report with clinical relevance to venous cannulation and obstetric surgery. **DOWNIE, Sherry A.**, Russell S. WHELAN*, Allen B. YEROUSHALMI*, Inga GUREVICH*, Mayra RODRIGUEZ*, Matthew D. RECKER*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 04** Capsular fibres of brachialis: an anatomical study. SULEMAN*, Shazeen, **Piroska L. SZABO** and Anne M. R. AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON. Physical Therapy Department, Touro College School of Health Sciences, Bay Shore, NY.
- 05** Age related changes of the morphology of the interosseous region of the sacroiliac joint: functional implications. ROSATELLI, Alessandro, Sam CHHAYA and **Anne M. R. AGUR**. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, CANADA. Musculoskeletal Radiology, University of Texas Health Science Centre at San Antonio, San Antonio, TX.
- 06** Architecture of the human lumbar multifidus: a pilot study. ROSATELLI, Alessandro and **Anne M. R. AGUR**. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, CANADA.
- 07** Articularis cubiti: morphology and muscle architecture. SULEMAN*, Shazeen, **Piroska L. SZABO** and Anne M. R. AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON. Physical Therapy Department, Touro College School of Health Sciences, Bay Shore, NY.
- 08** MRI changes in the median nerve related to occupational typing. **SHAFER-CRANE, Gail A.***; Ronald A. MEYER, Marcy C. SCHLINGER, D. Lee BENNETT, Kevin C. ROBINSON, and James J. RECHTIEN*. Division of

Anatomy and Structural Biology, Department of Radiology,
Michigan State University, East Lansing, MI.

- *09** The transverse humeral ligament and the soft tissues over the intertubercular sulcus of the humerus. **MIRKIN***, **Sue**, Marilyn J. **DUXSON***, Helen D. **NICHOLSON**, and Ming **ZHANG**. Department of Anatomy and Structural Biology, University of Otago, NEW ZEALAND..
- 10** Defining the palmar arterial branches. **McKECHNIE* Laura A.**, Paul J. **McNAMARA***, Stuart W. **McDONALD**. Laboratory of Anatomy, University of Glasgow, Glasgow, Scotland, UK.
- 11** Arterial diameters of the branches of the superficial and deep palmar arches. **McNAMARA* Paul J.**, Laura A. **McKECHNIE***, and Stuart W. **McDONALD**. Laboratory of Anatomy, University of Glasgow, Glasgow, Scotland, UK.
- 12** Variations in the branches of the suprascapular nerve to the supraspinatus and infraspinatus muscles. **DUNCAN, Olivia**, Aimee **McINTYRE**, and Stuart W. **McDONALD**. Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK.
- 13** The suprascapular nerve and its branches. **McINTYRE***, **Aimee**, Olivia **DUNCAN***, and Stuart W. **McDONALD**. Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK.
- 14** Unexpected prevalence of motor axons in the distal superficial radial and posterior interosseous nerves: a cadaver study with immunohistochemical evidence. Martina **Okwueze***, and **Lillian B. Nanney**. Department of Plastic Surgery, Cell & Developmental Biology, Vanderbilt School of Medicine, Nashville, TN.
- 15** Anatomical considerations on the “bare spot” of the glenoid cavity. **LONGATO, Stefano**, Franz **KRALINGER***, Helga **FRITSCH***, and Felix **AIGNER**. Innsbruck Medical University, Department of Anatomy, Histology and Embryology, Department of Traumatology and Department of General and Transplant Surgery, Innsbruck, AUSTRIA.

- 16 Loss of interstitial cells of cajal and gap junction protein Connexin 43 at the ureterovesical junction in children with vesicoureteral reflux. **LONGATO, Stefano**, Josef OSWALD*, Christian SCHWENTNER*, Andreas LUNACEK*, Christian RADMAYR*, and Helga FRITSCH*. Innsbruck Medical University, Division of Clinical and Functional Anatomy and Department of pediatric Urology, Innsbruck, AUSTRIA.
- 17 Anatomical considerations on a trans-cartilaginous approach to the posterior cricoarytenoid muscle (PCAM) for electro-stimulation. **LONGATO, Stefano**, Christoph HARLANDER*, Diana LAZARESCU*, Werner LINDENTHALER*, Johannes PIEGGER*, and Claus POTOSCHNIG*. Innsbruck Medical University, Division of clinical and functional Anatomy and Department of Otorhinolaryngology; MED-EL Austria, Innsbruck, AUSTRIA.
- *18 Mapping the contributions of the furcal nerve. **FERGUSON^{1*}, April**, Rae Lynne KINLER^{1*}, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *19 Re-examining the anatomy of the sacrotuberous ligament and its importance in pudendal nerve entrapment. **WHITE^{1*} Dorothy**, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *20 Iliolumbar membrane, a newly recognized structure in the back. **VAN DER WALL^{1*} Brad**, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- 21 Anatomical bases of entrapment neuropathy along the posterior rami of cervical and thoracic spinal nerves. **ISHIZUKA, Kyoko**, Toshihiro HORIE, Nobuyuki TSUZUKI, Kazumasa FUJITA, and Masabumi NAGASHIMA. Department of Orthopedic Surgery, Chofu Touzan Hospital and Koshi Rehabilitation Hospital, Department of Anatomy, Saitama Medical School, JAPAN.

- 22** Placental AT1 & AT2 receptors in pre-eclamptic placentae: an immunohistochemical study. **JUDSON, John P.**, Vishnadevi NADARAJAH*, Yi C. BONG*, Kalavathy SUBRAMANIAM*, Nalliah SIVALINGAM* and J RAVINDRAN*. International Medical University, Kuala Lumpur, MALAYSIA.
- 23** Assessment of the location of gravity line in scoliotic subjects during normal walking. **DANGERFIELD, Peter H.**^{1,2} Surendra BHANDI³, Nachiappan CHOCKALINGAM^{1,2,3}, Aziz RAHMATALLA³, and El-Nasri AHMED^{3,1}. ¹Faculty of Health and Sciences, Staffordshire University, Leek Road, Stoke on Trent. ²Departments of Human Anatomy and Cell Biology and Musculo Skeletal Science, University of Liverpool, Liverpool, ³Hartshill Orthopaedic Centre, University Hospital of North Staffordshire, Stoke on Trent, UK.
- *24** Mapping the nerve to the levator ani and its relevance in pelvic floor abnormalities. **HALLNER**^{1*}, **Barry**, Robert G LOUIS Jr. ^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *25** Examining the border and boundaries of the retropharyngeal space. **SKIDD**^{1*}, **Phil**, Jedd ALMOND^{1*}, Meghan LOIACANO^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *26** Examining the functional significance of the facial ligaments, septae and adhesions. **WESTBROOK**^{1*}, **Lisa**, Rhanjil SHAH^{1*}, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *27** The ligament of Berry, an important surgical landmark. **ANDERADIS**^{1*}, **Athena**, Quentin A. FOGG¹, Barry HALLNER^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *28 Communication patterns between the spinal accessory nerve and the cervical plexus. **TUCKER^{1*}, J. J.**, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, St. Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *29 Morphometry of the fourth ventricle. **GRIMMOND***, **Judith**, Magdalena KWIATKOWSKA^{1,2}, Justin LIEGMANN^{1*}, Rafal CHMIELEWSKI^{1,2}, Marcin KWIATKOWSKI^{2*}. ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine, St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Chalubinski Street 8, 05-004 Warsaw, POLAND.
- *30 The atlantal part of the vertebral artery. **GRIMMOND***, **Judith**, Magdalena KWIATKOWSKA^{1,2}, Justin LIEGMANN^{1*}, Rafal CHMIELEWSKI^{1,2}, Marcin KWIATKOWSKI^{2*}. ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine, St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Chalubinski Street 8, 05-004 Warsaw, POLAND.
- *31 The schema of the basilar artery branches to the pons. **GRIMMOND***, **Judith**, Magdalena KWIATKOWSKA^{1,2}, Justin LIEGMANN^{1*}, Rafal CHMIELEWSKI^{1,2}, Marcin KWIATKOWSKI^{2*}. ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine, St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Chalubinski Street 8, 05-004 Warsaw, POLAND.
- *32 Morphometry of the cerebral aqueduct. **GRIMMOND***, **Judith**, Magdalena KWIATKOWSKA^{1,2}, Justin LIEGMANN^{1*}, Rafal CHMIELEWSKI^{1,2}, Marcin KWIATKOWSKI^{2*}. ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine, St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Warsaw, POLAND.

- 33 Varied vasculatures in the head and neck, with consideration of clinical significance. **ASAMI, Yoshiko**, Eiko MURATA, Keiko FUJITA, Hideko MATSUMOTO, and Masabumi NAGASHIMA. Department of Anatomy, Saitama Medical School, Saitama, JAPAN.
- 34 Distribution pattern of glossopharyngeal and vagus nerves to pharyngeal muscles in humans. **SAKAMOTO, Yujiro**, and Keiichi AKITA*. Oral and Maxillofacial Biology, and Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, JAPAN.
- *35 Demonstrating the clinical anatomy of the Gow-Gates nerve block using fresh tissue cadavers. **OPACK***, **Joseph M.**, Ryan N. DOBBS*, Nicholas D. FREUEN*, and Neil S. NORTON. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE.
- 36 An anomalous inferior alveolar nerve formed by multiple contributions which surround the maxillary artery. **NORTON, Neil S.**, Margaret A. JERGENSON, and Laura C. BARRITT. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE.
- 37 Morphological alterations of submandibular glands caused by cisplatin in the rat. **SADAHARU* Kitashima**^{1,2}, Tsuyoshi SAGA^{1*}, Kei-ichiro NAKAMURA^{1*}, and Koh-ichi YAMAKI^{1*}. ¹Department of Anatomy, and ²Department of Dental and Oral Medical Center, Kurume University School of Medicine, Fukuoka, JAPAN.
- 38 Inhibitory RNAs to study cathepsin B functions in oral carcinoma cells. **Kik, Peter K.**, Nalinie WICKRAMASINGHE*, Nagaraj NAGATHAHALLI*, John MENSAH*, Simone BECKER*, Sabine WAIGEL*, and Wolfgang ZACHARIAS*. University of Louisville School of Dentistry, University of Louisville, Louisville, KY.
- 39 Histological study of the guttural pouches in caspian miniature horses. **REZAIAN, M.**, and R. PANDJSOTOON*. Division of Histology, Department of Basic Sciences, Faculty of Veterinary Medicine, Tehran University, Tehran, IRAN.

- 40 Variation in the size of lingual tonsil in 400 consecutive endoscopies. **KUMAR, Manoj**, Paramesh PUTTASIDDIAH*, Natarajan RAMALINGAM*, and Heikki B WHITTET. Singleton Hospital, Swansea, UK.
- 41 Level of anterior commissure in relation to thyroid cartilage. **BERRY, Sandeep**, Seena KUMAR*, Vanitha SUNDERARAJAN*, and Manoj KUMAR. University Hospital, Cincinnati, OH, and Singleton Hospital, Swansea, UK.
- 42 Anatomy and removable prosthodontics. **HARRIS^{1*}, Christine**, Michael T. BROAD^{1*}, and Stuart W. McDONALD². ¹Glasgow Dental School, ²Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK.
- 43 Anatomical basis of the stylohyoid syndrome. **KAGAN, Ilya I.**, and Victor V. LEBEDYANTZEV*. Department of Operative Surgery and Clinical Anatomy, Orenburg Medical Academy, Orenburg, RUSSIA.
- 44 Insights from a historical review of the maxillary nerve. **McLEOD*, Chloe** and Stuart W. McDONALD. Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK.
- 45 Tracheo-innominate artery fistula. A case report with a review of the management and description of anatomical risk factors for its development. **TASSONE, Peter***, and James M. F. CLARKE*. Departments of Otolaryngology and Vascular Surgery[#], Norfolk and Norwich Hospital, Norwich, UK. (sponsored by D. J. Heylings).
- 46 Computer simulation of the cerebral blood flow using patient-oriented models of the circle of Willis. **ZURADA*, Anna**, Jerzy St. GIELECKI*[#], Grzegorz GAJDA*, Niket SONPAL, Shawn KALEKA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- 47 Chronological expression of parathyroid hormone-related protein in the stellate reticulum of the rat first mandibular molar. **WISE, Gary E.**, Fenghui PAN*, and Shaomian YAO*.

Department of Comparative Biomedical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA.

- 48** MRI, MRA and MRV display costoclavicular compression and collateral venous drainage into the facial and vertebral veins in patients with thoracic outlet syndrome (TOS) and migraine. **SAXTON, Ernestina H.**, James D. Collins, Theodore Q. Miller*, Samuel S. Ahn*, and Alfred Carnes*. Departments of Radiological Sciences, Neurology and Vascular Surgery, David Geffen School of Medicine at UCLA, Los Angeles, CA.
- *49** The true popliteal attachments of posterior leg muscles may have a significant influence on knee function and its surgical repair. **JACOBSON^{1*}, Nathan A.**, A. Jay FREEMAN^{1*}, Marios LOUKAS^{1,2}, and Quentin A. FOGG^{1,3}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA; ³Department of Anatomy and Histology, Flinders University, Adelaide, AUSTRALIA.
- 50** Functionally significant variations of the pes anserinus and the clinical implications for tendon grafting and tibial compartment syndromes. **FREEMAN^{1*}, A. Jay**, Nathan A. JACOBSON^{1*}, Marios LOUKAS^{1,2}, and Quentin A. FOGG^{1,3}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA; ³Department of Anatomy and Histology, Flinders University, Adelaide, AUSTRALIA.
- 51** Quantitative anatomical and radiographic analysis of lateral ankle ligaments. **TASER, Figen***, Nabil A. EBRAHEIM*, Qaiser SHAFIQ*, and Carlos A.C. BAPTISTA. Medical College of Ohio, Department of Orthopaedics, and Neurosciences, Toledo, OH.
- 52** Enlarged perforating branch of peroneal artery and extra crural fascia in close relationship with the tibiofibular syndesmosis. **TASER, Figen***, Nabil A. EBRAHEIM*, Qaiser SHAFIQ*, Richard A. YEASTING*. Medical College of Ohio, Department of Orthopaedics, and Anatomy, Toledo, OH. (sponsored by Carlos A.C. Baptista).

- 53 Three-dimensional volume rendering of spiral CT data of the tibiofibular syndesmotic diastasis. **TASER, Figen***, Nabil A. EBRAHEIM*, Lee WOLDENBERG*, Richard A. YEASTING*, Carlos A.C. BAPTISTA. Medical College of Ohio, Department of Orthopaedics, Radiology, Anatomy and Neurosciences, Toledo, OH.
- 54 Tibial intraneural ganglia in the tarsal tunnel: Is there a joint connection? **SPINNER, Robert J.**, A. Lee DELLON*, Gedge D. ROSSON*, and Kimberly K. AMRAMI*. Departments of Neurologic Surgery and Radiology, Mayo Clinic and Foundation, Rochester, MN and Dellon Institute for Peripheral Nerve Surgery, Baltimore, MD.
- 55 The effects of combined torsion and bending loads on fresh human cadaver femurs. **FRICK*, Steve**, and David J. PORTA. Department of Anatomy, University of Louisville School of Medicine, and Department of Biology, Bellarmine University, Louisville, KY.
- 56 Symphysial angle of the mandible. **OOMMEN, Anitha**, Avinash V. MAINKER* and Tom OOMMEN. K.S. Hegde Medical Academy, Mangalore, and Colaco Hospital, Mangalore, INDIA.
- 8:30 a.m. **Platform Session 1** - Head and Neck .
Larry Ross - Moderator, *Salon/Ballroom A/B – 3rd floor.*
- * denotes eligible for *Ralph Ger Student Platform Presentation Award.*
- 8:30 Anthropometry of the eye-nose-lip complex in young adult Indian population. **MAHAJAN*, Mehendi V.**, Uday B. BHAT*, Suhas V. ABHAYANKAR* and Medha V. AMBIYE*. Department of Anatomy and Department of Plastic Surgery, Topiwala National Medical College, Mumbai, INDIA. (sponsored by B.R. MacPherson)
- *8:45 Bilateral duplicated internal jugular veins: case study and literature review. **SCHALOP*, Lee**, Sherry A. DOWNIE, Jonathan N. MAZUREK*, Gily SAVITCH*, Gary J. LELONEK*, and Todd R. OLSON. Department of Anatomy

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and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.

- 9:00 A review of injuries to the external branch of the superior laryngeal nerve (EBSLN) during thyroid surgery. **JONES***, **Gareth G.**, and Matthew J. WELCK*. Guy's King's and St Thomas's School of Biomedical Sciences, King's College, London, UK (sponsor Prof. H. Ellis).
- 9:15 Anatomical variations of the lingual artery. **PARKIN, Ian G.**, Rosana COBIELLA^{1*}, Eva MARANILLO^{2*}, Maria T. VAZQUEZ¹, Xavier LEON^{2*}, and Jose SANUDO¹. Department of Anatomy. Cambridge University. (UK), ¹Human Anatomy and Embryology I. Complutense University of Madrid and ²Morpho-logical Sciences Department. Autonomous University of Barcelona, SPAIN.
- 9:30 Imaging vessel vulnerability – how CT, MRI and ultrasound aid the anatomical assessment of hypoxic ischaemic encephalopathy. **VALAND, Sanjay***¹, Sachi SIVANANTHAN¹, and Fenella KIRKHAM². ¹Guy's, King's & St Thomas' School of Medicine, Kings College London, UK. ²Paediatric Neurology, Neurosciences Unit, Institute of Child Health, London, UK.
- 9:45 New microvenous anastomosis model in rats for microsurgical instruction: The external jugular vein. **DEMIRYÜREK, Deniz***², S. NASIR^{1*}, M. A. AYDIN^{1*}, N. KARAHANLI^{1*}, M. F. SARGON^{2*}, AND A. BAYRAMOGLU². ¹Suleyman Demirel University, Faculty of Medicine, Department of Plastic and Reconstructive Surgery, Isparta, TURKEY, ²Hacettepe University, Faculty of Medicine, Department of Anatomy, Ankara, TURKEY.
- 10:00 - 10:30 a.m. **Refreshment Break** – browse the posters and commercial exhibits – *Salon C/Financial Center Ballroom - 3rd floor*
- 10:30 - 11:00 a.m. **Chinese Visible Human Project (CVHP).**
ZHANG¹, Shao-Xiang, Pheng Ann HENG², Zheng-Jin LIU¹, Li-Wen TAN¹, and Rong-Xia LIAO¹. ¹Department of

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Anatomy, College of Medicine, Third Military Medical University, Chongqing, CHINA. ²Virtual Reality, Visualization and Imaging Research Centre, Department of Computer Science and Engineering, Chinese University of Hong Kong, Hong Kong, CHINA. (invited presentation arranged through Dr. Stephen Carmichael). *Salon/Ballroom A/B – 3rd floor*

11:00 - 12:00 p.m. *Keith L. Moore/Lippincott, Williams & Wilkins Presidential Address. James T. Goodrich, M.D., “Craniopagus twins: a historical approach to the anatomical separation of conjoined twin”s.* Division of Pediatric and Adult Neurological Surgery, Montefiore Medical Center, Albert Einstein College of Medicine, N.Y. *Salon/Ballroom A/B – 3rd floor*

12:00 - 1:00 p.m. **Lunch.** Browse the posters and commercial exhibits. *Salon C – 3rd floor, Financial Center Ballroom- 2nd floor.*

1:00 p.m. **Scientific Platform Session 2 - Lower Limb.**
Brian R. MacPherson – Moderator.
Salon/Ballroom A/B – 3rd floor

* denotes eligible for *Ralph Ger Student Platform Presentation Award.*

1:00 In vivo examination of the connective and adipose tissues in the orbital apex and superior orbital fissure. **FIRBAS, Ulrike***, Stefan MENG*, Silvi U.G. WENINGER*, Wolfgang J. WENINGER*, and Wilhelm FIRBAS. Krankanstalt Rudolfstiftung, Vienna, Integrative Morphology Group, Medical University Vienna, AUSTRIA.

1:15 The application of three-dimensional rendering to joint-related ganglia. **SPINNER, Robert J.**, Phillip K. EDWARDS*, and Kimberly K. AMRAMI*. Departments of Neurologic Surgery, Orthopedics, Biomedical Engineering and Radiology, Mayo Clinic, Rochester, MN.

1:30 A proposal for logical and consistent anatomical nomenclature for cutaneous nerves of the limbs. **GEST, Thomas**

Wednesday, July 20th

R., William E. BURKEL, and Gerald W. CORTRIGHT.
Division of Anatomical Sciences, University of Michigan
Medical School, Ann Arbor, MI.

- *1:45 A new perspective on the traditional saphenous vein cut-down. **SPARR***, Jennifer, Ralph GER, Sherry A. DOWNIE, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY.
- 2:00 Correlation of the intercondylar notch dimensions of the femur to the measurements of lower extremity surface landmarks. **BAYRAMOGLU¹, Alp**, Ali K. TONAK^{2*}, Nuran YENER^{1*}, Mutlu HAYRAN^{3*}, and Deniz DEMRYÜREK¹.
¹Hacettepe University, Faculty of Medicine, Department of Anatomy, ³Preventive Oncology, Ankara, ²Inonu University, Faculty of Medicine, Department of Orthopedics, Malatya, TURKEY.
- 2:15 The anatomical importance of the tibial nerve and its branches in facilitating endoscopic approach to the tarsal tunnel. **WIJERATNA***, Malin D., Nicholas R. EVANS* and John OLDER. Department of Anatomy, School of Biomedical Sciences, Kings College, London, UK.
- 2:30 - 3:00 p.m. **Refreshment Break** - browse the posters and commercial exhibits – *Salon C – 3rd floor and Financial Center Ballroom – 2nd floor*
- 3:00 p.m. **Scientific Platform Session 3** - Upper Limb
Alan Moulton – Moderator.
Salon/Ballroom A/B – 3rd floor
- 3:00 Ligamentous support of the scaphoid and its influence on carpal motion theories. **FOGG, Quentin A.**^{1,2}, Gregory I. BAIN^{3*}, Raymond A. TEDMAN^{2,4*}. ¹Department of Anatomy and Histology, American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Department of Anatomical Sciences, the University of Adelaide, Adelaide, South Australia, and ³Modbury Public Hospital, Adelaide, ⁴Department of Anatomy, Griffith Medical School, Griffith University, Gold Coast, Queensland, AUSTRALIA.

- 3:15 Block of the suprascapular nerve - quo vadis liquore? **FEIGL Georg**, Barbara WENINGER*, Walter ROSMARIN*, Christian DORN* and Rudolf LIKAR*. Department of Anatomy Graz, Department of Anesthesiology and Pain Therapy, Hospital Graz, and Department of Anesthesiology and Intensive Medicine, LKH Klagenfurt, AUSTRIA.
- 3:30 The subsynovial connective tissue- a specialized gliding structure within the carpal tunnel. **AMADIO, Peter C.**, Anke M.ETTEMA, Chunfeng ZHAO, and Kai-Nan AN. Department of Orthopedic Surgery, Mayo Clinic College of Medicine, Rochester, MN.
- 3:45 The Tabatiere Anatomique. **TUBBS, R. Shane**, E. George SALTER, and W. Jerry OAKES*. Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL.
- 4:00 Francesco Parona and Parona's Space: A historical, anatomical and clinical review. **PATEL, Dhaval M.**, Sai RAMASASTRY*, and Umberto, BAREATO. Department of Plastic and Reconstructive Surgery, University of Illinois at Chicago, IL.
- 4:15 Synchondrosis of cervical and first ribs causes costo-clavicular compression of the great vessels and thrombosis of the subclavian veins in patients with thoracic outlet syndrome (TOS) and migraine: MRI/MRA/MRV. **COLLINS, James D.**, Ernestina H. Saxton, Theodore Q. Miller*, Samuel S. Ahn*, and Alfred Carnes*. Departments of Radiological Sciences, Neurology and Vascular Surgery, David Geffen School of Medicine at UCLA, Los Angeles, CA.
- 4:30 Shoulder joint arthropathy: which comes first - rotator cuff tear or acromioclavicular arthritis? **HAYWARD* Katy**, John BRIDGER, and Ian G. PARKIN. University of Cambridge Anatomy Department, Cambridge, UK.
- 4:45 How safe is the median nerve? A cadaveric study assessing the accuracy of injecting into the carpal tunnel. **Yaqoob***, **M.**, R. Dias*, A. Temple*, D. Shannahan, S. Deshmukh*. The Royal Orthopaedic Hospital, Birmingham. Dept. of Anatomy, Newcastle University, UK.

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5:00 - 6:00 p.m. **“Off-Broadway producers: How to ensure high quality manuscript submissions”**. Patrick Snajder and Karen Accavallo, Production editors, *Clinical Anatomy*. (arranged through Dr. Stephen Carmichael) *Salon/Ballroom A/B – 3rd floor*

Thursday, July 21st, 2005

7:00 - 8:00 a.m. **Anatomical Services Committee Meeting** – *Empire Room – 3rd floor* (All interested registrants are invited to attend).

7:00 - 8:00 a.m. **Past President’s Breakfast** – *Roy’s – 1st floor*

8:00 - 2:00 p.m. **Registration/Check-in** – *Salon/Ballroom Foyer – 3rd floor*

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

9:00 a.m.- 4:30 p.m. **Poster Session 2** - Thorax, Abdomen, Embryology, and Education, *Financial Center Ballroom – 2nd floor*

All posters listed below will be on display **throughout Thursday**, 9:00 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*.

* indicates is eligible for the *Sandy C. Marks, Jr. Student Poster Presentation Award*

***57** The tendon of infundibulum rediscovered. **CHRISTOPHERSON^{1*}, Cali**, Michael KENT^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

***58** Rare congenital variations in coronary arteries and their significance in sudden cardiac death. **SOUTH^{1*}, Gina**, and

Thursday, July 21st

Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *59 False tendons: an alternative imaging technique to fill the gaps left by echocardiography. **PHAM^{1*}, Diane**, Brandie BLACK^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *60 The internal anatomy of the genitofemoral nerve. **ALSHEIC^{1*}, Eva**, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *61 An anatomical study of the ilioinguinal nerve, a detailed examination of a complicated structure. **STUART^{1*}, Lynsey**, Robert G. LOUIS Jr. ^{1*}, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *62 Space of Bogros and space of Retzius, is there a communication? **CAMERON^{1*}, Chang**, Chen ROGER^{1*}, Robert G. LOUIS Jr. ^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *63 Perirenal communications and spaces: a closer look. **NAGY^{1*}, Ryan**, Robert G. LOUIS Jr. ^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *64 A new description of a thoracic venous arch bridging the internal thoracic veins. **REED^{1*}, Lesley**, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *65 Avoiding injury to the phrenic nerve during coronary artery bypass. **CANDI^{1*}, Sagar**, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint

Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- *66 Ultrasonographic imaging of the sinotubular ridge may provide early insight into the development of atherosclerosis in human aorta. **ARORA^{1*}, Shagun**, Robert G. LOUIS Jr.^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *67 Arcuate line, is it constant? **BATSON^{1*}, Nick**, Brent LARSEN^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- 68 A cadaver dissection case: a right descending aorta with other vascular anomalies. **SILVERMAN*, Bruce**, Kevin HOLMAN*, Nathan DONALDSON* and David J. ELIOT. Touro University - California, Vallejo, CA.
- 69 Diverticulitis of a true caecal diverticulum - clinical pictures. **SINHA, Amit***. Russells Hall Hospital, Department of Surgery, Dudley Group of Hospitals NHS Trust. (sponsored by B.R. MacPherson).
- 70 Intraparenchymal morphology of vascular elements in the dorso-petal liver. Study on corrosion casts. **MATUSZ, Petru L.** University of Medicine and Pharmacy "Victor Babes" Department of Anatomy, Timisoara, ROMANIA.
- 71 Intraparenchymal morphology of vascular elements in the ventro-petal liver. Study on corrosion casts. **MATUSZ, Petru L.**, Delia Elena ZAHOI*, and Agneta Maria PUSZTAI*. University of Medicine and Pharmacy "Victor Babes" Department of Anatomy, Timisoara, ROMANIA.
- 72 A morphological study of the internal thoracic artery in cadavers. **Kenin, S.**, V. Belkin, Y. Bengal, J. Solomon, and B. Arensburg.
- 73 Comparison of radiologic and *in situ* studies on initial parts of lumbar arteries. **PIETRASIK^{1,4}, Kamil**, Leopold BAKON^{1,3}, Ireneusz NAWROT^{*4}, Pawel KRAJEWSKI^{*2}, Magorzta BRZOZOWSKA^{*2}, and Bogdan CISZEK^{*1}. ¹Department of

Anatomy, ²Department of Forensic Medicine, ³IInd Department of Radiology, ⁴Department of General, Vascular and Transplant Surgery, The Medical University of Warsaw, POLAND.

- *74** The clinical anatomy of the papillary muscle of the conus. **TONGSON, Jonathan**^{1*}, Artur BARTCZAK^{3*}, Martin FUNDALEJ^{4*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA; ³Department of Pathology, Institute of Rheumatology, Warsaw, ³Department of Forensic Service, Warsaw, Medical University, Warsaw, POLAND.
- *75** Cysterna chyli, a detailed anatomical look. **WARTMANN**^{1*}, **Christopher**, Robert G. LOUIS Jr.^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
- *76** Re-defining the surgical anatomy of the medial and lateral pectoral nerve for use in neurotization procedures. **LOUIS, Robert G. Jr.**^{1*}, John FITZSIMMONS³, Gene COLBORN¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA., ³Michigan State University Department of Radiology, MI.
- *77** Is direct contact with cadavers valuable and necessary? Similarities and differences as they apply to English and Polish division medical students. **POLAK***, **Martyna**, Anna MIS* Niket SONPAL*, Jerzy St. GIELECKI*[#], Anna ZURADA*, Pawel RDES*, and Bozena SYC*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- *78** Digital-image analysis of variations in lateral cord of the brachial plexus in human fetuses. **POLAK***, **Martyna**, Marek SZCZECHLA*, Nirali PATEL* Niket SONPAL*, Jerzy St. GIELECKI*[#], Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).

- *79** The differences in reactions and feelings of English and Polish divisions of medical students after direct contact with cadavers. **MIS***, **Anna**, Martyna POLAK*, Niket SONPAL*, Jerzy St. GIELECKI*, Anna ZURADA*, and Pawel RDES*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- *80** Suprarenal gland mass analysis in human fetuses. **BUCZEK***, **Aleksandra**, Karolina MIKUS*, Niket SONPAL*, Jerzy St. GIELECKI*, Anna ZURADA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- *81** Digital-image analysis of the radial artery with unusual variations found in a human fetus. **DODD***, **Philip**, Niket SONPAL*, Jerzy St. GIELECKI*, Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- *82** Digital-image analysis of renal artery variations in human fetuses and their clinical significance. **SONPAL***, **Niket**, Philip DODD*, Jerzy St. GIELECKI*, Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- *83** Digital-image analysis of the acetabulum in human fetuses. **HEBDA***, **Anna**, Niket SONPAL*, Jerzy St. GIELECKI*, Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND (sponsored by S. W. Carmichael).
- *84** Digital-image analysis of the medial cord of the brachial plexus in human fetuses. **SZCZECHLA*** **Marek**, Martyna POLAK*, Nirali PATEL* Niket SONPAL*, Jerzy St. GIELECKI*, Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. (sponsored by S. W. Carmichael).
- 85** Incorporating a “Waiting Room” component into human anatomy lectures facilitates the transition between basic science knowledge and clinical applications. **STEFAN**,

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- Cristian.** Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA.
- 86** Accuracy of students' estimate of their histology individual scores in answering multiple choice questions is correlated with the actual grades. **STEFAN, Cristian,** Ancuta M. Stefan*, and Stephen Baker*. Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA.
- 87** A new method of integrating cross-sectional imaging and dissection in clinical anatomy. **SALKOWSKI, L. R.** Department of Radiology, Medical College of Wisconsin, Milwaukee, WI.
- 88** A comparison between the use of glass slides versus projected digital images in histology lab exams. **BARRITT, Laura C.,** and Neil S. NORTON. Department of Oral Biology, Creighton University, Omaha, NE.
- 89** "Round robin" peer instruction in the anatomy laboratory (grade analysis and student survey). **ELIOT, David J.,** Glenn DAVIS*, and Walter C. HARTWIG*. Touro University College of Osteopathic Medicine, Vallejo, CA.
- 90** An analysis of ultrasound training and usage in the United States and other countries. **POZNANSKI, Ann A.*,** Thomas R. GEST, and David A. JAMADAR*. Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI.
- 91** Social support among medical students: An exploration using Playback Theatre. RAJU*, Priya, **Anne M. R. AGUR,** and Monica BRANIGAN*. Program for Advice and Support of Students, Departments of Surgery and Family and Community Medicine, Faculty of Medicine, University of Toronto, Toronto, ON, CANADA.
- 92** Phylogenetic narrative as a vectored systems approach in teaching medical school clinical anatomy. **BOAZ, Noel.** Ross Medical School, Dominica, WEST INDIES.
- 93** Revisiting applied gross anatomy- an elective for 4th year medical students. **PIEKUT, Diane T.** Department of

Neurobiology and Anatomy, University of Rochester,
Rochester, NY.

- 94** Design and evaluation of an academic game in a clinical anatomy course. **MILLER, Brian T.**, and Thomas J. COLLINS*. Division of Anatomy, Department of Neuroscience and Cell Biology, University of Texas Medical Branch, Galveston, TX.
- 95** The microscopic morphology of human embryo sections on computer disks. **GASSER, Raymond F.** and R. John CORK. Louisiana State University Health Sciences Center, Department of Cell Biology and Anatomy, New Orleans, LA.
- 96** Morphology of the preimplantation stages of human embryos. **GASSER, Raymond F.** and R. John CORK. Louisiana State University Health Sciences Center, School of Medicine, Department of Cell Biology and Anatomy, New Orleans, LA.
- 97** Evidence that migration during embryogenesis is unnecessary in events traditionally considered to be migratory. **GASSER, Raymond F.** Louisiana State University Health Sciences Center, School of Medicine, Department of Cell Biology and Anatomy, New Orleans, LA.
- 98** From micro to gross: the journey of a developmental neuroscientist into the world of gross anatomy. **DE RIVERO VACCARI***, Juan Carlos, Roderick A. CORRIVEAU*, and Richard H. WHITWORTH, Jr. Department of Cell Biology and Anatomy, Louisiana State University Health Sciences Center, New Orleans, LA.
- 99** Student responses to the cadaver lab. **FITZSIMMONS John M.**, Gillian BICE, Bina VORA, Marios LOUKAS, and Dennis GILLILAND*, Department of Radiology and Department of Statistics, Michigan State University, MI and Department of Anatomy, American University of the Caribbean, Sint Maarten NA.
- *100** Value of learning Latin and Greek etymologies for anatomic and medical terminology. **SMITH, Sean B.***, Stephen W. CARMICHAEL, Wojciech PAWLINA, and Robert J.

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- SPINNER. Mayo Medical School and Department of Anatomy, Mayo Clinic and Mayo Foundation, Rochester, MN.
- 101** Bribery as a pedagogical tool for encouraging student participation in high-enrollment lecture courses. **BICE, Gillian***, John M. FITZSIMMONS, and Connie E. OSBORN. Department of Radiology, Michigan State University, MI.
- 102** Self-Prepared dissection or prosection: What is best for learning human anatomy? **COPE, Janet M.**, M. Susan GUYER*, Katherine M. POST*, and Jennifer SHEA*. Human Anatomy, Springfield College, Springfield, MA.
- 103** Benefits of virtual microscopy in teaching histology to first year medical students. **SHAFER-CRANE, Gail**, Connie OSBORN*, and Wendy LACKEY*. Division of Anatomy and Structural Biology, Department of Radiology, Michigan State University, East Lansing, MI.
- 104** Enhancing peer taught dissection rotations: Introduction of the laboratory quiz. **MARTINO, Leon J.**, Nancy A. WILSON-MARTINO*, and Charles H. KITE*. Division of Medical Education, Albany Medical College, Albany, NY.
- 105** Evaluation of the thoracic anatomy module at Manipal. **NAIR, Narga.** Department of Anatomy, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, Karnataka, INDIA.
- 106** Simultaneous physical and digital MR/CT 2D/3D dissection of a human cadaver combines classical, radiological and surgical anatomical instruction in a first-year honors anatomy course. **HISLEY, Calvin**, Larry ANDERSON*, Ronald WADE, Stephen KAVIC*, Paul NAGY* and Ivan GEORGE*. University of Maryland School of Medicine, Baltimore, MD; Departments of Radiology, Anatomy and Neurobiology, Surgery and the Maryland State Anatomy Board.
- 107** Benefits of online pre-laboratory quizzes in a dental gross anatomy course. **BRUECKNER, Jennifer K.** and Andrew M. HARRIS*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington, KY.

- 108 An acquired partial hair shaft anomaly. **DEMIRYUREK Deniz²**, P. OZTAS^{1*}, G. GÜR^{1*}, M. POLAT^{1*}, B. YALCIN^{1*}, E.TAMER^{1*}, M.F. SARGON^{2*}, A. ZARARSIZ^{3*}, and N.ALLI^{1*}. ¹Ankara Numune. Education and Research Hospital First Dermatology Clinic; ²Hacettepe University Faculty of Medicine Department of Anatomy; ³Ankara Nuclear Research and Training Center, Head of XRF Section, TURKEY.
- 109 CAD and FE compatible virtual model of human-thin skin epidermis. **HILBELINK, Don R.**, Karl MUFFLY*, Erin MORSE*, and Eric HOEGSTROM*. Department of Anatomy, University of South Florida, Tampa, FL.
- 110 Wavelet analysis of heart geometry for morphological modeling. **HILBELINK, Don R.**, Britney R. THOMAS*, Sunil SAIGAL*, Eric HOEGSTROM*. University of South Florida, Department of Anatomy and Department of Civil Engineering, Tampa, FL.
- 111 Three dimensional Cartesian coordinate system for the human body. **HILBELINK, Don R.** Department of Anatomy, University of South Florida, Tampa, FL.
- 112 Changing trends in the teaching of anatomy. **TU, Khin, M.;** Gerald R. CONNOVER* and Patrick C. HARDIGAN*. College of Medical Sciences, Nova Southeastern University, Ft. Lauderdale, FL.
- 113 A comparison of students' performance in multiple choice question vs. short answer question format in anatomy spotter exams. **MOQATTASH, Satei**, Hani SAMAWI*, Omar HABBAL*, Ibrahim INUWA*, Ravinder KENUE*, and Ziad BATAINEH*. Department of Anatomy, College of Medicine, and Department of Mathematics, College of Science, Sultan Qaboos University, Muscat, SULTANATE OF OMAN.
- 114 The Student Liaison Group – enhancing the Quality Assessment Report within a developing Curricular Quality Assurance Plan. **MacPherson, Brian R.** Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY.

115 Using Internet2 to learn clinical anatomy of the knee joint: An interactive, collaborative stereoscopic lesson. **RAOOF, Ameer M.**, and Sakti SRIVASTAVA. Division of Anatomical Sciences, The University of Michigan Medical School, Ann Arbor, MI. Anatomy & Surgery Applications, University of Stanford Medical School, Stanford, CA.

8:00 a.m. **AACA TechFair Session**
Greg Smith - Moderator, *Salon/Ballroom A/B – 3rd floor*

* denotes eligible for *Ralph Ger Student Platform Presentation Award*

*8:00 Anatomic QuickTime movies: A practical application for creating an individual library of laboratory models and specimens. **REGAN*, Annie E.**, and Gregory R. SMITH. Department of Biology, Saint Mary's College of California, Moraga, CA.

*8:10 Novel use of a computer scripting language to highlight structures in a web-based interactive histology atlas. **PATEL*, Sanjay G.**¹, Benjamin P. ROSENBAUM*¹, Davin W. CHARK*¹, and H. Wayne LAMBERT²: ¹Vanderbilt University School of Medicine, Nashville, TN, ²University of Louisville School of Medicine, Anatomical Sciences and Neurobiology, Louisville, KY.

*8:20 Making an interactive web-based histology atlas more functional and adaptable for medical students. **ROSENBAUM*, Benjamin P.**¹, Sanjay G. PATEL*¹, Davin W. CHARK*¹, and H. Wayne LAMBERT². ¹Vanderbilt University School of Medicine, Nashville, TN. ²University of Louisville School of Medicine, Anatomical Sciences and Neurobiology, Louisville, KY.

8:30 A new multimedia approach for teaching and learning the pterygopalatine fossa. **BRUECKNER, Jennifer K.**, and Thomas DOLAN*. University of Kentucky College of Medicine, Anatomy and Neurobiology and the Teaching and Academic Support Center, Lexington, KY.

8:40 Development and delivery of a series of online undergraduate courses in Human Anatomy & Physiology.

Thursday, July 21st

HILBELINK, Don R. Department of Anatomy, University of South Florida, Tampa, FL.

- 8:50 A digital dissector guide of human regional anatomy. **PARKIN, Ian G.**, Jose SANUDO¹, Teresa VAZQUEZ, Ricardo BRIME^{1*}, Juan CABELLO^{1*}, Helena ALVAREZ^{1*}, and Raffaele DE CARO². Department of Anatomy, Cambridge University, United Kingdom, ¹Department of Human Anatomy and Embryology I. Complutense University of Madrid, Spain. ²Department of Human Anatomy and Physiology, Section of Anatomy, University of Padova, ITALY.
- 9:00 The diagnostic image collection and cross section navigator, computer based learning tools that help students learn basic radiographic and cross sectional anatomy. **OXBERRY, Brett A.** Department of Anatomy and Cell Biology, Temple University School of Medicine, Philadelphia, PA.
- 9:10 Recent additions to the HEIRLOOM website. **CORK, R. John** and Raymond F. GASSER . Louisiana State University Health Sciences Center, Department of Cell Biology and Anatomy, New Orleans, LA.
- 9:20 Rotator cuff muscles: a three-dimensional educational tool utilizing animation and video. **SITU*, Gloria**, Anne M.R. AGUR, Jodie JENKINSON*, and Nicolas WOOLRIDGE*. Biomedical Communications, Institute of Communication and Culture UTM, Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON.
- 9:30 A web-accessible, secure database for an anatomical donations program. **GEST, Thomas R.**, Dean A. MUELLER*, Carolyn WHITE*, Mary BERNIER*, and Shioh-Hwa GAU*. Division of Anatomical Sciences, Anatomical Donations Program, and Medical School Information Systems, University of Michigan Medical School, Ann Arbor, MI.
- 9:40 Computer based learning – the future to supplementing the 21st century student. **GIELECKI*, Jerzy St.**, Anna ZURADA*, and Niket SONPAL*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND (sponsored by

Thursday, July 21st

S. W. Carmichael).

- 9:50 Learning modules and games as substitutes for anatomy lectures. **GEST, Thomas R.**, William E. BURKEL, Gerald W. CORT-RIGHT, Geraldine DURKA-PELOK*, Tamara STEIN*, Dana ARONSON*, Tashfeen EKRAM*, Okeoma MMEJE*, Charisa ROY*, Robyn SACKKEYFIO*, Kirsten SALMEEN*, and Danielle TURNER*. Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI.
- 10:00 - 11:00 a.m. **Hands-On Techfair Opportunity:** - 2nd floor:
Treasury Board Room: Regan, Patel, Rosenbaum and Brueckner
Capital Room: Hibilink, Parkin, Oxberry, and Cork
Traders Room: Situ, Gest, and Gielecki
- 10:00 - 11:00 a.m. **Refreshment Break and browse the posters**
Salon C – 3rd floor, and Financial Center
Ballroom – 2nd floor
- 11:00 a.m. **Marc Prensky.** Educational Affairs Committee presentation "*Engage Me or Enrage Me*": *Educating Today's "Digital Native" Learners..* *Salon/Ballroom A/B – 3rd floor*
- 12:00 - 1:00 p.m. **Lunch**
- 1:00 - 2:30 p.m. **AACA Annual Business Meeting** (all members and membership applicants) – *Salon/Ballroom A/B – 3rd floor*
- 1:00 - 2:30 p.m. **BACA Annual Business Meeting,** *Empire Room – 3rd floor*
- 2:30 - 3:00 p.m. **Refreshment Break** - browse the posters and commercial exhibits – *Salon C, 3rd floor and Financial Center Ballroom – 2nd floor*
- 3:00 - 5:00 p.m. **Educational Affairs Symposium,** "*The role of medical health science institutes in preK-12 outreach programs*"- *Salon/Ballroom A/B – 3rd floor*

Friday, July 22nd

- 6:30 p.m. **Reception** (cash bar)
Grand Ballroom Foyer – 3rd floor
- 7:00 p.m. **Annual Banquet** and presentation of Honored
Member Award – *Grand Ballroom – 3rd floor*

Friday, July 22nd, 2005

- 7:00 - 8:00 a.m. **Educational Affairs Committee Breakfast**,
*“Breakfast with the Experts” – Marc Prensky will be
in attendance” – Salon/Balloom A/B 3rd floor*
- 8:00 a.m. **Platform Session 4: Education 1**
Peter Dangerfield - moderator. *Salon/Ballroom A/B
– 3rd floor*
* denotes eligible for *Ralph Ger Student Platform
Presentation Award.*
- 8:00 The difficulties facing anatomical and medical research
involving cadavers in the U.K. **WELCK***, **Matthew, J.**,
Gareth G. JONES, and Harold ELLIS. Guy’s King’s and St
Thomas’s School of Biomedical Sciences, King’s College,
London, UK.
- *8:15 A course-specific approach to developing a virtual learning
environment in anatomy. **LIM* H. Jayne**, Matthew D.
GARDINER*, and Ian P. JOHNSON. Department of
Anatomy and Developmental Biology, University College
London. UK.
- 8:30 Iatrogenic deaths related to anatomical ignorance in surgical
application and the re-introduction of whole body cadaveric
dissection for surgical trainees in Australia. **STEWART,**
Fiona. Royal Australasian College of Surgeons Anatomy
Committee; Co-ordinator RACS Anatomy by Dissection,
N.S.W; Clinical Forensic Medical Unit, N.S.W. Police
Service; Department of Anatomy and Histology, University of
Sydney, AUSTRALIA.
- 8:45 Junior doctors’ knowledge of applied clinical anatomy.
GUPTA* Yuri, Mia **MORGAN***, Annika **SINGH***, and Harold

Friday, July 22nd

ELLIS. Department of Anatomy, Cell and Human Biology, GKT School of Biomedical Sciences, Guy's Campus London Bridge, London, UK.

- 9:00 Reflections: the undergraduate anatomy curriculum. **HEYLINGS, David J.A.** School of Medicine Health Policy and Practice, University of East Anglia, Norwich, Norfolk.
- 9:15 Teaching head and neck anatomy using reconstructive modeling. **ALLMAN***, **Casey C.**¹, William D. DAVENPORT¹, and Raymond R. RAWSON*². ¹School of Dental Medicine, University of Nevada Las Vegas, Las Vegas, and ²Community College of Southern Nevada, Las Vegas, NV.
- 9:30 Human spatial morphometrics. **HILBELINK, Don R.**, Department of Anatomy, University of South Florida, Tampa, FL
- 9:45 The role of cadavers in problem based learning. **TU***, **Khin, M.**, Gerald R. CONOVER*, Donna C. HERMEY, Jonathan K. KALMEY and Patrick C. HARDIGAN*. College of Medical Sciences, Nova Southeastern University, Ft. Lauderdale, FL.

10:00-10:30 a.m. **Refreshment Break – Salon C – 3rd floor**

8:00 a.m. **Platform Session 5:**
Daniel O. Graney - moderator - *Financial Center Ballroom – 2nd floor*

* denotes eligible for *Ralph Ger Student Platform Presentation Award.*

- 8:00 Motion picture images of movement disorders involving the head and neck in postencephalitic parkinsonism. **VILENSKY, Joel A.**, Sid GILMAN* and Christopher GOETZ*. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Fort Wayne, IN, Department of Neurology, University of Michigan School of Medicine, Ann, Arbor, MI, and Department of Neurological Sciences, Rush Presbyterian – St. Luke's Medical Center, Chicago, IL.

- 8:15 Incidence of cardiovascular disease in the dissecting room. A valuable teaching asset. **CHUN, Joo-Young***, Thomas THEOLOGOU*, and Harold ELLIS. Department of Anatomy, Guy's Campus, Kings College London, UK.
- *8:30 Technique for evaluating intravascular pressure changes in blunt hepatic trauma. **SPARKS***, **Jessica L.**, Jason STAMMEN*, Rod HERRIOTT*, and Ken JONES. The Ohio State University, Injury Biomechanics Research Laboratory, and Vehicle Research Test Center, and Transportation Research Center, East Liberty, OH, and The Ohio State University, Division of Anatomy, Columbus, OH.
- 8:45 A fresh look at the osteoligamentous structures of the cervical spine. ACKERMANN*, Michael J. and **Margaret H. COOPER**. Center for Anatomical Science and Education, Saint Louis University School of Medicine, St. Louis, MO.
- 9:00 Unusual variant of the spinal dural sheath: a case report. **LOUGHENBURY, Peter R.***, Sharan WADHWANI*, and Roger W. SOAMES[†]. School of Biomedical Sciences, University of Leeds, UK and [†]School of Veterinary and Biomedical Sciences, James Cook University, Queensland, AUSTRALIA.
- 9:15 Comprehensive understanding of the continuity of abdominal and pelvic visceral fasciae. **SATO***, **Tatsuo**¹, Hirokazu SAKA-MOTO², Sadaaki HEIMA¹, Yoko TSUBO¹, Kumiko YAMA-GUCHI¹, and Keiichi AKITA¹. ¹Clinical Anatomy, Tokyo Medical and Dental University Graduate School, and ²Division for the Visually Impaired, Tsukuba College of Technology.
- 9:30 Anatomical basis of surgical treatment of female stress urinary incontinence. MACCHI, Veronica*, **Andrea PORZIONATO***, Dan SMITH*, Giacomo NOVARA*, Mario GARDI*, Walter ARTIBANI * and Raffaele DE CARO. Departments of Human Anatomy and Physiology, and Oncological and Surgical Sciences, University of Padova, ITALY.
- 9:45 A newly discovered endoscopic surgical procedure for the release of the pudendal nerve. **LOUKAS, Marios**^{1,2}, and

Friday, July 22nd

Robert G. LOUIS Jr. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.

- 10:00 - 10:30 a.m. **Refreshment Break** *Salon C – 3d floor*
- 10:30 a.m. **Platform Session 6:** - Education 2
David Heylings - moderator, *Salon/Ballroom A/B – 3rd floor*
- 10:30 Virtual human anatomy navigation system. **HILBELINK, Don R.**, and Abhijit LOTHE*. Department of Anatomy, University of South Florida, Tampa, FL.
- 10:45 Replacing lecture with an interactive computerized study guide improves student attitudes and performance in gross anatomy. **WINESKI, Lawrence E.**, Perry RIGGINS*, and Rebecca A. SEALAND*. Department of Anatomy & Neurobiology, and Division of Information Technology Services, Morehouse School of Medicine, Atlanta, GA.
- 11:00 Expanding the role of plastination in anatomy education. **RAOOF, Ameer M.**, Christina I. BAUMANN*, Katherine C. FALK*, Natalie M. HENDON*, Longping LIU*, Adriane C. MARCHESE*, Lauren A. MARCHESE*, Rishi P. MEDIR-ATTA*, Neda MIRAFZALI*, Jacqueline L. MUNCH*, Christopher M. PARRES*, Michael T. WELLS*, and Heping ZHAO*. Division of Anatomical Sciences, The University of Michigan Medical School, Ann Arbor, MI.
- 11:15 Clinical neuroanatomy and student's learning. **MACCHI, Veronica***, Andrea PORZIONATO*, Cristian STEFAN¹, Anna PARENTI*, and Raffaele DE CARO, Departments of Human Anatomy and Physiology, and Oncological and Surgical Sciences, University of Padova, ITALY, and ¹Department of Cell Biology, University of Massachusetts Medical School Worcester, MA.
- 10:30 a.m. **Platform Session 7:** -
Stuart McDonald - moderator, *Financial Center Ballroom – 2nd floor*

Friday, July 22nd

- 10:30 Are dissection videos and other web-based materials an effective substitute for actual dissection in a medical anatomy curriculum? **GRANGER, Noelle A.**, Diane C. CALLESON*, and Jennifer M. BURGOON. Department of Developmental and Cell Biology, Department of Family Medicine and the School of Public Health, and the School of Education, University of North Carolina, Chapel Hill, NC.
- 10:45 Superior vena caval thrombus with an unusual systemic to portal venous collateral pathway. **MORRISON¹, Stuart C.**, Sunny PITT^{1*}, and Richard L. DRAKE². Department of Radiology¹, Department of Surgery² Cleveland Clinic Lerner College of Medicine, Cleveland Clinic Foundation, Cleveland, OH.
- 11:00 Tumor development and its relation to the sympathetic chain of a young girl. **PORTA, David J.** Department of Biology, Bellarmine University, and Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, KY.
- 11:15 Coeliac trunk: thoracic or abdominal origin from the aorta? **BRIDGER, John**, Ian G. PARKIN, and Katy HAYWARD*. University of Cambridge Anatomy Department, Cambridge, UK.
- 11:30 - 12:00 p.m. ***Ralph Ger Student Platform Presentation and Presidential Travel Award Presentation award presentations. In Memorium*** tribute to Hanno Boon. *Salon/Ballroom A/B – 3rd floor*
- 12:00 p.m. **Adjournment**
- 1:00-2:00 p.m. **ACA New Council Lunch Meeting – Treasury Boardroom – 2nd floor**

Saturday, July 23rd

Saturday, July 23, 2005

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



22nd Annual Meeting Postgraduate Course

***Willed Body Program Management and
Cadaver Preservation Techniques***

Anatomical Preparation Course
July 23, 2005

8:30 am - 4:00 pm
Weill College of Medicine of Cornell University

Organizer

Brandi Schmitt

Office of the President, University of California.
ACA Anatomical Services Committee

*Specimens used in the course were provided by Anatomical Gifts
Program, Albany Medical College, Dr. Leon J. Martino.*

Embalming solutions provided by Carolina Biological Supply.

8:30 am Bus departs from Marriott Financial Center Hotel (*main
entrance*) for Weill Cornell Medical College.

9:00 - 9:45 a.m. Continental Breakfast & Registration – *Archibald
Commons.*

Saturday, July 23rd

- 9:45 - 10:00 a.m. Welcoming remarks - *Weill Auditorium*.
Brandi Schmitt, Office of the President, University of California, Oakland, CA.
- 10:00 - 10:30 a.m. A condensed history of anatomical embalming.
Ronald S. Wade, State Anatomical Board, University of Maryland, Baltimore, MD.
- 10:30 - 11:00 a.m. Whole body donors: Their relevance in alternate disciplines. **Quentin A. Fogg¹** and **Charlotte Wacker²**. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Donated Body Program, University of California, Davis, CA.
- 11:00 - 11:30 a.m. A simple method to create and maintain a dermestid beetle colony. **Rebecca Bullard** and **Andrew Corson**. Department of Entomology, University of California, Davis, CA.
- 11:30 - 1:00 p.m. Lunch - *Griffis Faculty Club*.
- Afternoon Laboratory Session in the Gross Dissection Laboratory. PPE and changing facilities will be provided. Scrubs or other personal lab wear should be brought by the attendee.*
- 1:00 - 1:30 p.m. Formaldehyde neutralization in the laboratory.
William E. Burkel¹ and **Dean A. Mueller²**. ¹Department of Medical Education; ²Anatomical Donations Program, University of Michigan Medical School, Ann Arbor, MI.
- 1:30 - 2:00 p.m. Corrosion casting with household bleach. **Dean R. Fisher**. Anatomical Donations Program, Mayo Clinic. Rochester, MN.
- 2:00 - 3:30 p.m. Anatomic embalming: A comparison of preservation techniques. **Quentin A. Fogg¹**, **Brandi Schmitt²**, and **Charles Garrison³**. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Office of the President, University of California, Oakland, CA; ³Program in Gross Anatomy, Weill Cornell Medical College, New York, NY.
- 3:30 - 4:00 p.m. Summary discussion and closing remarks.

Abstracts

ACKERMANN*, Michael J. and Margaret H. Cooper. Center for Anatomical Science and Education, Saint Louis University School of Medicine, St. Louis, MO. A fresh look at the osteoligamentous structures of the cervical spine.

The focus of this study is the complex osteoligamentous structures of the cervical spine and the articulations between the individual vertebrae and the skull. It illustrates how the individual bone and ligament components fit and function together forming a complete unit. Twenty-four detached cervical specimens were dissected in anterior and posterior approaches. In the anterior group the arch of the atlas was removed to illustrate the odontoid process and its ligamentous attachments. In the posterior group a laminectomy was performed to show the relationships of the ligamentous structures to the odontoid process, atlas and skull. An interesting observation was the cruciform ligament as it lies anterior to the tectorial membrane. The two structures were difficult to separate, but when successful the cruciform ligament was observed to be formed by superior and inferior bands that run vertically and a substantial transverse band running horizontally. Superior to the transverse band in two specimens a transverse occipital ligament was found extending between the occipital condyles with attachment to the alar ligaments and odontoid process. A complete understanding of the complex anatomy of the cervical spine is important in understanding the mechanisms of injury, surgical procedures and normal functions of the spine.

ALLMAN*, Casey C., William D. DAVENPORT and Raymond R. RAWSON¹*. School of Dental Medicine, University of Nevada Las Vegas, and ¹Community College of Southern Nevada, Las Vegas, NV. Teaching head and neck anatomy using reconstructive modeling.

A thorough understanding of head and neck anatomy is crucial to the practice of clinical dentistry. Traditionally, the dental student is first introduced to this information through cadaver dissection. This proven and well-accepted method of teaching this body of information is expensive in terms of dedicated laboratory space; material acquisition, preparation, and storage; and actual curriculum time. Based on empirical data, the University of Nevada Las Vegas, School of Dental Medicine (UNLV SDM) adopted a technique of using reconstructive modeling for teaching functional head and neck anatomy. The technique involves reconstructing essential head and neck anatomical structures using museum-grade skull replicas and

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dental waxes. The purpose of this study is to highlight this approach, and assess its validity as an appropriate teaching methodology for dentistry. The educational value of this methodology is discussed, and the results of a student survey are reported. We recognize the difficulty of evaluating a new program and establishing its precedence, however, we feel that the educational value and novelty of this approach are noteworthy. This is an ongoing project and it is anticipated that the progress of this course and further research and will be presented in the future.

ALSHEIC^{1*}, Eva, Quentin A. FOGG¹, andc Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. The internal anatomy of the genitofemoral nerve.

The anatomy of the genitofemoral nerve has been well studied concerning inguinal hernia repairs. However, its internal anatomy including its origins remains to be elucidated. In order to provide a more complete description, we have studied 200 formalin fixed cadavers during the years of 2003-2005. The genitofemoral nerve was present in all cases and 2 types were recognized. In type I (72%) the nerve presented as a single trunk that divided distally. In type II (28%) the main trunk immediately divided into two main rami: genital and femoral. The trunk or rami were usually formed by nerve fibers from L1-L2 from the lumbar plexus. The level of emergence of the nerve or nerves from the psoas major muscle and the level of division into terminal branches were individually highly variable. Type I was present bilaterally in 70.5% and type II in 10% of cases. The manner in which the genitofemoral nerve arose from the lumbar plexus varied markedly. Nerves of type I arose from single root in 70% of the cases and from two roots in 5% of cases. Single rooted specimens arose by the union of the ventral branches of spinal nerves L1-L3. In double-rooted nerves the upper root arose from L1 and or from L1, L2; the lower root arose from L1, L2, from L2 and from L3. Both roots, after a short course, joined within the substance of the psoas major muscle. Our findings could have significance by providing data to the pathophysiology of genitofemoral neuralgias.

AMADIO, Peter C., Anke M.ETTEMA, Chunfeng ZHAO, and Kai-Nan AN. Department of Orthopedic Surgery, Mayo Clinic College of Medicine, Rochester, MN. The subsynovial connective tissue- a specialized gliding structure within the carpal tunnel.

Carpal tunnel syndrome (CTS) is extremely common, yet its etiology remains unknown in most cases. While the compression neuropathy

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of the median nerve within the carpal tunnel has been well described, the tissues in which it resides and moves have not been systematically analyzed in the past. The subsynovial connective tissue (SSCT) is a specialized gliding structure that envelops the tendons and conveys vascularity to them within the carpal tunnel. We have analyzed the gross, microscopic, and ultrastructural anatomy of the SSCT in 30 patients with idiopathic CTS, and 30 cadavers with no antemortem history of CTS. We have observed that the SSCT in patients with CTS is thicker, stiffer, less vascular, and glides differently than it does in individuals without CTS. Histologic observations have shown that the SSCT changes in the CTS specimens are maximal closest to the tendon, suggesting that the primary pathology in carpal tunnel syndrome may arise within the SSCT, possibly as the consequence of a shearing or other injury.

ANDERADIS^{1*} Athena, Quentin A. FOGG¹, Barry HALLNER^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. The Ligament of Berry, an important surgical landmark. It is important to clarify the relationship between the recurrent laryngeal nerve (RLN) and the ligament of Berry to prevent damage to the RLN in thyroid surgery. The purpose of the present study is to identify this relationship in order to prevent surgical complications. We dissected 200 thyroid glands derived from formalin fixed cadavers during the years of 2003-2005. 400 RLNs were identified and their course detected and analyzed. The topography of the laryngotracheoesophageal region and morphology of the ligament of Berry were studied in detail. All nerves identified were located postero-lateral to the ligament of Berry. They were clearly separated, and no nerve penetrated the ligament, nor was any nerve located medial to it. The ligament of Berry connected the thyroid gland to the trachea and was identified as a whitish connective tissue band, attached to the inferior margin of the cornu of the cricoid cartilage, near its pole, and extended infero-medially onto the tracheal wall. The mean distance between the attachment of the ligament to the cricoid cartilage and the RLN entry point to the larynx was 1.6mm with a range of 1-3.3mm. It was confirmed that the RLN never penetrates the ligament of Berry, but is located lateral to it. From these topographic findings, injury to the RLN could be avoided by performing a separation close to the goiter, in thyroid surgery.

ARORA^{1*}, Shagun, Robert G. LOUIS Jr ^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHER-

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LANDS ANTILLES; ²Harvard Medical School, Boston, MA. Ultrasonographic imaging of the Sinotubular ridge may provide early insight into the development of atherosclerosis in human aorta.

Atherosclerosis has been observed in the sinutubular ridge (STR) in early life. However, the reasons for such focal lesions have not yet been established. The purpose of this study therefore, was to examine, macroscopically and histologically, the sinutubular junction (the place of STR development), in order to examine the peculiarities of this location. The sinutubular junction is an imaginary line connecting the sinus portion of the aorta with the tubular. This line is the place that the STR can be found. We examined 100 adult hearts macroscopically and with an 6.5MHz and 5MHz General Electric Ultrasound RT2800. In addition, we examined 30 neonatal hearts without any known cardiac malformations, however, with variable degrees of atherosclerosis. We were able to identify the STR in all hearts. A significant association was present between the thickness of the ridge and the age of the specimen. In the younger hearts, we were able to identify the STR only histologically, whereas in a 10-year-old's heart it was clearly visible macroscopically. Interestingly we were able to identify that the STR was the first place of atherosclerotic plaque formation, excluding the fatty streaks that were also present in an unrelated manner. In older subjects the STR presented with local calcifications and hemorrhages. In neonatal hearts the STR appeared to have intimal and medial thickening with fragmented or absent internal elastic lamina. This suggests that the thickening represents a physiologic adaptation to changes in flow and wall tension. It is important to recognize that such changes represent locations in which atherosclerotic lesions are prone to develop. Because the STR is the first location where atherosclerotic plaques develop, recognition of sinutubular ridge formation with ultrasound could prove useful in early detection of the development of atherosclerotic lesions.

ASAMI, Yoshiko, Eiko MURATA, Keiko FUJITA, Hideko MATSUMOTO, and Masabumi NAGASHIMA. Department of Anatomy, Saitama Medical School, Saitama, JAPAN. Varied vasculatures in the head and neck, with consideration of clinical significance.

Branching patterns of the ophthalmic artery are dissected with total 109 donated cadavers (Matsumura and Nagashima: Cells Tissues Organs 164: 112-121, 1999). Varied pathologies are related with topographic anatomy of the internal carotid artery running through the cavernous sinus and surrounding meninges. Venous drainage is highly varied around the torcular Herophili. Bony grooves for the

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dural sinuses on the inner occipital surface were observed in total 160 dry skulls (Singh, Nagashima, Inoue: Surgical and Radiologic Anatomy 26: 480-487, 2004). Venous sinus continuity was categorized into the symmetric and asymmetric groups. About a half of cases was of the symmetric group and remaining cases were asymmetric. However, the right dominant type was the most frequent (40%) and the left dominant type was the least (10%). Height of the common carotid bifurcation was investigated with relation to the carotid body and/or Herring's nerve (carotid sinus branch of the glossopharyngeal nerve). Morphogenesis of this branching pattern will be considered, on the bases of the specific case with bilaterally high-positioned bifurcation. Variations in the vasculatures as mentioned above will be discussed from the viewpoint of pathophysiological, diagnostic, and therapeutic significance in neurosurgery and interventional radiology.

BARRITT, Laura C., and Neil S. NORTON. Department of Oral Biology, Creighton University, Omaha, NE. A comparison between the use of glass slides versus projected digital images in histology lab exams.

Oral histology, a core component of the basic science curriculum, is taught in the first year of dental school. The course is taught to 68 students using a lecture-based format followed by a weekly laboratory section. Each laboratory section which is designed to reinforce lecture material, utilizes microscopic analysis of glass slides as the primary method of instruction. Students are assessed using a glass slide-based format for the laboratory exam. While the microscopic-based method of testing has several positive attributes, it is time consuming to administer and can be frustrating for students. Students frequently encounter difficulty in identifying structures as well as determining the plane of section and orientation for the tissue sample. Another concern is variation between staining and specimen quality. Therefore we sought to investigate if changing the exam format influenced student performance. In the present study 68 students were divided into two groups and evaluated by one of two testing methods. Group one identified structures using a glass slide-based format and group two identified the same structures by projected digital images. We found there was no significant difference in the final score using either testing method.

BATSON^{1*}, Nick, Brent LARSEN^{1*}, and Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHER-

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LANDS ANTILLES; ²Harvard Medical School, Boston, MA. Arcuate line, is it constant?

The anatomy of the anterior abdominal wall plays a most significant role in surgery. The arcuate line (AL) is a relevant structure when reconstructing the abdominal wall after rectus abdominis musculocutaneous flap harvest. Its location is classically taught to be half the distance from the pubic symphysis to the umbilicus, but recent anatomic literature provides evidence to the contrary. The aim of our study was to provide anatomical data for a better understanding of the relationship between the AL and surface anatomic landmarks, which could facilitate better preoperative planning when harvesting a rectus abdominis musculocutaneous flap. A total of 100 formalin fixed cadavers were dissected during 2004-2005. The AL was found to be at 70.2% of the distance from the pubic symphysis to the umbilicus, and 33.9% of the distance from the pubic symphysis to the xiphoid process. This location was 2.1+/- 2.3 cm superior to the level of the anterior superior iliac spines. Furthermore, we examined the rate of shifting of fibers. In Type I (65%) the fibers of the posterior rectus sheath (PRS) gradually disappeared over the transversalis fascia. In Type II (25%) the termination of the fibers of the PRS was acutely demarcated over the transversalis fascia. In Type III (10%) the fibers of the PRS created a double thick aponeurotic line (double arcuate line). This study provides further support for the finding in the anatomic literature that the arcuate line is located substantially more superiorly than has been classically described. This knowledge may prove useful in preoperative planning of rectus abdominis musculocutaneous flap harvest.

BAYRAMOGLU¹, Alp, Ali K. TONAK^{2*}, Nuran YENER^{1*}, Mutlu HAYRAN^{3*}, and Deniz DEM_RYÜREK¹. ¹Hacettepe University, Faculty of Medicine, Department of Anatomy, ³Preventive Oncology, Ankara, ²Inonu University, Faculty of Medicine, Department of Orthopedics, Malatya, TURKEY. Correlation of the intercondylar notch dimensions of the femur to the measurements of lower extremity surface landmarks.

Although there is controversy regarding the relationship between the size of the intercondylar notch of the femur and sports related tear of anterior cruciate ligament (ACL), many investigators have suggested that the presence of a narrow intercondylar notch predisposes to ACL tears. In the literature, different types of indices have been studied to define the stenotic intercondylar notch but the correlation of the notch dimensions to the measurements of lower extremity surface landmarks has not been mentioned. 33 normal knees from

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the 18 embalmed cadavers between the ages of 29-61 were evaluated in this study. Our results showed that, a) the shape index of the intercondylar notch and femur shape index (calculated from external measurements) were significantly inversely correlated ($p=0.001$) and b) the externally measured condylar width of femur and the patellar width were significantly correlated with the depth of the lateral condyle of femur ($p<0.001$). We believe that knowing the correlation between external measurements and intercondylar notch dimensions might be important to make a prediction for ACL injury. Further clinical and experimental studies have to be carried out to clarify the correlation of external measurements in cases of ACL tears.

BERRY Sandeep, Seena KUMAR*, Vanitha SUNDERARAJAN*, and Manoj KUMAR. University Hospital, Cincinnati, OH, and Singleton Hospital, Swansea, UK. Level of anterior commissure in relation to thyroid cartilage. The position of the anterior commissure is of great interest to the otolaryngologists and head and neck surgeons. It would be helpful to know the actual position of the anterior commissure in relation to the thyroid cartilage prior to entering the larynx in a number of surgical scenarios, e.g. supraglottic laryngectomy. Although a number of studies have been carried out to predict the level of anterior commissure, no consensus has been reached so far. Method: Measurements were carried out at the time of autopsy examination of 29 adult patients. Two measurements were carried out, one from the thyroid notch to the level of the anterior commissure, and another from the lower border of the thyroid cartilage to the anterior commissure. Cases in which there was an obvious laryngeal pathology was not included. Results: The average distance from the thyroid notch to the anterior commissure for female was 1.12, the same as that of males. However the distance from the anterior commissure to thyroid notch was 0.9 for females and 1.31 for males. Conclusion: The distance from the anterior commissure tendon to the lower border of the thyroid cartilage was found to be different between males and females.

BICE, Gillian*, John M. FITZSIMMONS, and Connie E. OSBORN. Department of Radiology, Michigan State University, MI. Bribery as a pedagogical tool for encouraging student participation in high-enrollment lecture courses.

Engaging students in high-enrollment courses is challenging. This report describes a method used in an undergraduate gross anatomy lecture course to encourage student participation through bribery

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with bonus points. Enrollment in gross anatomy is 300-plus students per section. Past attempts to engage students during lecture have been only marginally successful. In Spring 2005, the students' coursepack included four 8.5"x 11" cards, printed on both sides with a letter (A & D) large enough to be visible from any location in a 500 seat lecture hall. During lecture a multiple-choice question was projected, and students indicated their answer by holding up the appropriate card. Initial participation was limited to 25 - 50% of the class. To increase participation the students were told that, if everyone held up a card, the entire class would get a bonus point for the day. Participation increased to near 100%. This simple, time-efficient method has advantages for both student and instructor. Students get practice answering exam type questions and receive immediate feedback. For the instructor, having the entire class visibly respond to a question allows insight into the students' thought processes, and offers an excellent opportunity for in-class discussion and review.

BOAZ, Noel. Ross Medical School, Dominica, WEST INDIES.

Phylogenetic narrative as a vectored systems approach in teaching medical school clinical anatomy.

Evolutionary biology provides a powerful framework for understanding the structural and functional organization of the human body. Human evolution is now an interdisciplinary narrative extending from life's earliest beginnings some 3.8 billion years ago to the present day. Its general lineaments are supported by a wealth of comparative anatomical, paleontological, molecular evolutionary, and developmental data. A scheme of 17 levels of morphophysiological adaptation in human phylogeny is used here to organize a systems-based course in Clinical Anatomy, one that proceeds from simple to more complex. Pathology is treated as dysfunction in one or more of these levels of adaptation, thus establishing for students a firm structural and functional basis for understanding and evaluating clinical conditions. A systems-based approach offers the advantage of integration across disciplines and a phylogenetic or "evo-devo" approach adds a logical sequence to the systems studied. Human phylogeny as an organizing narrative provides an effective means for students to learn and retain anatomical information.

BRIDGER John, Ian G PARKIN, Katy HAYWARD* University of Cambridge Anatomy Department, Cambridge, UK. Coeliac trunk: thoracic or abdominal origin from the aorta?

In radiological practice it is necessary to know the positions of origin

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of the coeliac trunk and superior mesenteric artery. The former is widely accepted as arising inferior to the median arcuate ligament at the level of T12, the latter arising a further centimetre inferiorly. The arteries were studied in 50 cadavers at the University of Cambridge. The distance between the lower border of the coeliac trunk and the upper border of the superior mesenteric artery was measured as the coeliac trunk emerged from below the median arcuate ligament. In the majority of cases the coeliac trunk appeared to arise above the ligament and was compressed by it. The distance between the two arteries varied from 0 to 2cm, however they were usually adjacent but this measurement did not reflect the internal origin. The ligament, therefore, was divided and the arteries fully exposed. A flap of aorta was turned so that the distance between the orifices of the arteries could be reliably measured internally. This ranged from 11 to 24cm apart. The external appearance does not reflect the origins of these arteries, nor does it clearly show that the true origin of the coeliac trunk is the thoracic and not abdominal aorta.

BRUECKNER, Jennifer K and Thomas DOLAN*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology and the Teaching and Academic Support Center, Lexington, KY. [A new multimedia approach for teaching and learning the pterygopalatine fossa.](#)

The pterygopalatine fossa is a deep region of the head that is small and inaccessible, making its anatomy difficult for students to understand. To enhance classroom instruction and student independent study of this topic, we are developing a multimedia tutorial addressing the three dimensional structure of the pterygopalatine fossa. The three-dimensional component of the program was constructed using both Silo™ and Z Brush™. These models were exported into Swift 3D™ where they were transformed into vector images, which were incorporated into Macromedia Flash. The program consists of three modules addressing the osseous boundaries and foramina of the fossa. The first module is an introduction to the pterygopalatine fossa, including its key neurovascular contents and their clinical relevance. Module two focuses on the position and boundaries of the fossa, which were illustrated from six different anatomical perspectives. Module three is currently under development and assimilates all of the views introduced in the prior module using an interactive three-dimensional model of the fossa. Preliminary student feedback suggests that this product will serve as an effective independent study aid by

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addressing and remedying common student questions and misperceptions about the anatomy of the fossa.

BRUECKNER, Jennifer K. and Andrew M. HARRIS*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, Lexington, KY. Benefits of online pre-laboratory quizzes in a dental gross anatomy course.

Lack of student preparation for gross anatomy laboratory is a dilemma for many course directors. Valuable lab time is wasted as students wait for instructors' guidance on initiating each dissection. To encourage pre-laboratory preparation in dental gross anatomy, a series of timed, pre-lab mastery quizzes was created using Blackboard™. Randomized block quizzes were generated from question pools created for each lab. The quizzes were open book and based on text from the dissection guide as well as images from Grant's atlas. Students could take each quiz multiple times in order to master the topic and earn the desired grade. A midterm survey evaluated student perceptions of the mastery quizzes. Most students perceived that completing the quizzes enhanced their learning in lab, particularly on days that they dissected (70%). Only 46% prepared for lab on days with no pre-lab quiz. The majority of students (72%) took each quiz 2-3 times, with most (78%) completing each quiz in 6-15 minutes. Most students (86%) felt the pre-lab mastery quizzes were a useful learning tool. Analysis of lab practical exam questions confirmed that students performed significantly better on exam questions from labs preceded by mastery quizzes as compared to those without required pre-lab preparation.

BUCZEK*, Aleksandra, Karolina MIKUS*, Niket SONPAL*, Jerzy St. GIELECKI[#], and Anna ZURADA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. [#]Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). Suprarenal gland mass analysis in human fetuses.

Many structures within the human fetus develop and increase in size or weight significantly during the second and third trimester of gestation. The suprarenal glands are a significant structure for endocrinologists, and knowledge of its development can aid a physician in understanding both its function and possible pathology. At the Medical University of Silesia in Katowice, Poland, 82 spontaneously aborted fetuses ranging in age from 13 weeks to 30

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weeks, (81-female, 66-male and 74 left, 73 right), were dissected and had their suprarenal glands measured for mass. Upon correlation (Statistica 6) of age and weight, a statistically significant correlation ($\alpha < .05$), and a direct linear relationship was found, while the correlation of age and gender was not found. Furthermore upon the use of the t-test to measure the relationship of weight and age, the values were found to be statistically significant, while those of age and gender were found to be insignificant. The suprarenal gland also shows tremendous growth between the 21st and 27th week of gestation. Clinically, such knowledge can prove useful upon understanding the main characteristics of both glands and comprehending their significance during inherited disease.

BURNS*, E. Robert. Department of Neurobiology and Developmental Sciences, College of Medicine, University of Arkansas for Medical Sciences, Little Rock, AR. Fifteen years of experience in preK-12 health science outreach. (sponsored by Rustin E. Reeves).

In 1991 UAMS established its "Partners in Health Sciences" (PIHS) program. PIHS is statewide and has 8 subcomponents: 1) Professional development workshops in the summer for teachers, 2) Interactive television (ITV) outreach to grade 7-12 students during the academic year, 3) Computer-assisted authoring workshops for teachers; 4) Student field trips to UAMS, 5) Evening lecture series at a science magnet high school, 6) Community requested presentations, 7) College credit opportunities for BA/MA education majors and 8) Workshops exclusively for PreK teachers. As of January 1, 2005, 16,123 participants have consumed 62,760 hours of training. The workshops involved 195 different faculty in 106 different topics in 218 workshop days. Teachers attended from 96% of the state's counties. Participants receive a "tool kit", which includes an illustrated syllabus and materials for teachers to conduct experiments/demonstrations with their students. The ITV effort reached students in 67% of the counties and involved students from MT, WVa, NY, LA, CA, FL, TX, and Taiwan. Funding was received from the AR Department of Higher Education, The Kellogg Foundation, the AR Cancer Coalition, the Bank of America and a Science Education Partnership Award (R25RR12346) from the NCRR-NIH.

CAMERON^{1*}, Chang, Chen ROGER^{1*}, Robert G. LOUIS Jr.^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School,

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Boston, MA, USA. Space of Bogros and Space of Retzius, is there a communication?

The preperitoneal space (space between the peritoneum and transversalis fascia [TF]), the space of Bogros (space between the peritoneum and posterior lamina of the TF) and the space of Retzius are used routinely in laparoscopic procedures. Despite the clinical relevance, the specific anatomy, in both the literature and anatomy textbooks, remains obscure and often incorrect. Of particular importance is the identification and description of the posterior lamina of TF, the vesicoumbilical fascia, the lateral borders of the space of Retzius and space of Bogros and the possible connection between them. The aim of this study is to contribute to the development of valuable anatomical knowledge of these structures. Fifty formalin fixed cadavers were examined during the period of 2004-2005. The posterior laminae of TF fused at the arcuate line in 60% of the specimens, while in the remaining 40%, they fused 1cm below. The posterior lamina of TF is synonymous with the vesicoumbilical fascia that originated within the space of Retzius from the external surface of the neck of the bladder. Laterally the vesicoumbilical fascia blended over the external musculature of the bladder leaving a communication between the space of Bogros and space of Retzius. Inferolaterally the vesicoumbilical fascia, together with the mesentery-like tissues associated with the ductus deferens or round ligament, appear to act as a delicate barrier between the space of Bogros and space of Retzius. These new anatomical data could be useful in laparoscopic and open procedures at the inguinal region.

CANDI,^{1*} Sagar, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
Avoiding injury to the phrenic nerve during coronary artery bypass.

The right phrenic nerve (RP) is at risk of injury during high mobilization of the right internal mammary artery (RIMA) during a coronary bypass grafting. Patients with persistent phrenic nerve injury have increased acute and midterm morbidity after operation, as well as reduced quality of life. The aim of the study was therefore, to provide anatomical data for the location of the phrenic nerve in order to avoid iatrogenic injuries. Fifty formalin fixed cadavers were examined during the period of 2004 and 2005. In 45% of the specimens the RP crossed over (from lateral to medial) the origin of RIMA. In 35% of the specimens the RP appeared to descend into the thorax 1 cm postero-lateral to the origin of the RIMA and, in the

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remaining 20%, the descent was 1 cm postero-medial to the origin of RIMA. On the left side, the left phrenic nerve appeared to always be present postero-medially, at a relatively safe distance from the left internal mammary artery. Traction on the nerve, vascular compromise, the adjacent use of diathermy, or a combination thereof, may result in injury to the RP and thus respiratory compromise. High harvesting of the RIMA should be avoided in patients with preexisting impairment of lung function when alternative methods of revascularization may provide similar benefits.

CHRISTOPHERSON^{1*}, Cali, Michael KENT^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. The tendon of infundibulum rediscovered.

The heart is a muscular organ supported by collagenous tissue. It is condensed in certain areas to form a collagenous framework, often called the fibrous skeleton. The so-called tendon of the Infundibulum has previously been described as part of this skeleton, but its structure and frequency remain ill defined. The tendon was initially described as a strip of fibrous tissue situated between the aortic root and the pulmonary trunk. Since information on its structure is vague, we sought to evaluate its existence in 100 formalin fixed adult human hearts, ranging in age from 22 to 86 years, and 20 infant hearts which ranged from 2 months to 6 years. We used classical macroscopic anatomical techniques to demonstrate all the possible connections between the sinuses of the aorta and the pulmonary trunk. We then supplemented the macroscopic techniques with serial transverse histological sections taken through the vascular roots, and stained with eosin-hematoxylin, van Gieson, Masson trichrome, and orcein staining methods. Fascial bands surrounded by connective tissue were observed in all hearts. In 80 adult hearts, and in 16 neonatal hearts we observed fascial bands or strips which connected the aortic and pulmonary roots. Only in two hearts were we able to identify tendon-like structures, and showed that these were formed by tightly packed collagen fibers that were intermingled with fat as a result of advanced age. Thus, in those cases where a "tendon" was present, it was no more than condensed fascial bands joining together the apposing sinuses of the arterial trunks. In our opinion, therefore, accounts in the literature describing the tendon of the Infundibulum as a tendinous structure connecting the aortic and pulmonary roots do not accurately represent the anatomic situation.

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CHUN, Joo-Young*, Thomas THEOLOGOU*, and Harold ELLIS. Department of Anatomy, Guy's Campus, Kings College London, UK. Incidence of cardiovascular disease in the dissecting room. A valuable teaching asset.

The purpose of this study was to determine the incidence of cardiovascular pathology in 50 cadavers in the dissecting room of the department of Anatomy at Guy's campus Kings College London, and to demonstrate the importance of dissection in teaching the anatomy of normal and pathological hearts. After external evaluation of each heart the four chambers were dissected and studied. The features noted include evidence of arteriosclerosis, myocardial infarction, coronary artery abnormalities, valvular disease, left ventricular wall thickness, atrial dimensions and evidence of anatomical anomalies. All the hearts studied had at least one pathology. The majority had severe arteriosclerosis (44) and aortic valve disease (23). A large number had left ventricular hypertrophy (13) and left atrial enlargement (9). A small number showed evidence of myocardial infarction (4). Anatomical anomalies found were persistent foramen ovale (1), 3 coronary aortic ostia (2) and anatomical variances of the orientation of the left main stem of the left coronary artery (2). This study demonstrates that dissection is not only an excellent tool for the study of normal cardiac anatomy, but also a valuable teaching method in introducing common cardiac pathologies to the medical student.

COLLINS, James D., Ernestina H. Saxton, Theodore Q. Miller*, Samuel S. Ahn*, and Alfred Carnes*. Departments of Radiological Sciences, Neurology and Vascular Surgery, David Geffen School of Medicine at UCLA, Los Angeles, CA. Synchondrosis of cervical and first ribs causes costoclavicular compression of the great vessels and thrombosis of the subclavian veins in patients with thoracic outlet syndrome (TOS) and migraine: MRI/MRA/MRV.

Patients with TOS present with pain, tingling, numbness and pins-and-needles in the upper limbs, shoulders and neck; headache and facial pain; visual changes, and syncope. Patients may have structural anomalies of the cervicothoracic spine. Synchondrosis deformities of cervical and first ribs are often overlooked on PA chest radiographs. Bilateral MRI/MRA/MRV display osseous and vascular anomalies including synchondrosis deformities and costoclavicular compression in TOS. Synchondrosis of the cervical and first ribs predisposes to costoclavicular compression of the subclavian artery and binding nerve roots, and the draining veins within the neck and supraclavicular fossae. In round shoulder deformities the first rib

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moves forward and the manubrium and the clavicle move backwards, compressing the bicuspid valves in the internal jugular and subclavian veins (FASEB J. 2001; 15:544) causing TOS symptoms and acute subclavian venous thrombosis (Paget-Schroetter syndrome). Bilateral MRI, MRA/MRV display venous obstruction without the use of contrast. Blood flow changes are displayed according to proton density 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. Two patients are selected for this presentation with synchondrosis of cervical and first ribs, both displaying costoclavicular vascular compression, one with Paget-Schroetter syndrome.

COPE, Janet M., M. Susan GUYER*, Katherine M. POST*, and Jennifer SHEA*. Human Anatomy, Springfield College, Springfield, MA. Self-Prepared dissection or prosection: What is best for learning human anatomy?

Throughout history dissection of the human body has been considered an integral part of medical education, however, during the past several decades there has been a significant decline in the amount of time medical students spend in gross anatomy courses. As many schools weigh the cost effectiveness of cadaveric based anatomy courses and optimal use of student learning time there is much debate as to how to maintain competency in this foundational course. Springfield College, located in Western Massachusetts prepares students in a variety of health care professions including athletic training (AT), occupational (OT) and physical therapy (PT). During the 2004 spring semester of the Human Anatomy II Course six subjects (two AT, OT, PT) were assigned to weekly dissection based peer teaching (DBPT) sessions instead of their discipline specific classroom based peer teaching sessions. Eighty-three percent of the (DBPT) subjects improved their overall grade for the course as compared to their colleagues from the previous fall 2003 semester and students who spent more time dissecting earned the better grades for this course. Although this research represents a small sample, it provides support for involvement in some dissection as a potential method of enhancing student examination performance. (Sponsored by a Grant from the Springfield College Research Fund).

COOPER, Margaret H. Practical Anatomy Workshop, Center for Anatomical Science and Education, Saint Louis University School of

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Medicine, St. Louis, MO. Adventures in Medicine and Science (AIMS) a youth community outreach program.

AIMS is a community outreach program that provides a variety of health education learning experiences for middle and high school students. Local health-care professionals from various specialties and anatomists present a 3-D demonstration with the cadaver as a basis of discussion. Hands-on cadaver demonstrations for high school students are an activity with medical and graduate students presenters. Over 100 occur a year. Hands-on dissections of pig hearts, cow eyes and sheep brains also led by medical and graduate students are a popular activity. A summer program for high school juniors and seniors, who think they are interested in medicine, provides a unique opportunity for students to explore numerous facets of medicine. The participants take part in a variety of experiences including 3-D demonstrations of the cadaver; observations of prosected cadavers; dissections of cow eyes, pig hearts and sheep brains; operating room observations; rehabilitation facility visits and interactions with patients and physicians. Distance learning programs using cadaver demonstrations or animal dissections are led by an instructor, based in the AIMS Virtual Anatomy Classroom, who has an opportunity to be interactive with students at a distance learning site. Students in all aspects of AIMS have an opportunity to observe and have hands-on experiences which brings anatomy out of the textbooks and makes it alive for them.

CORK, R. John and Raymond F. GASSER Louisiana State University Health Sciences Center, Department of Cell Biology and Anatomy, New Orleans, LA. Recent additions to the HEIRLOOM website.

The HEIRLOOM (Human Embryo Imaging and Reconstruction, Library Of Online Media) website is a part of the Virtual Human Embryo Project that provides online access to the microscopic morphology of human embryos from the Carnegie collection. Currently, databases for stages 1-13 are available on CDs and DVDs. Recent updates to the HEIRLOOM website have now made the databases accessible online together with search and define functionality. The online databases include all the labeled sections found on the disks but they have only one level of magnification as opposed to the two or three zoom levels available on the disks. The graphical interface for the online databases has been improved and is consistent throughout all the stages. A database of terms can be searched to locate sections containing particular features. These

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sections can then be used as entry points for browsing the embryo sections. We have now added an "explain" function where terms are linked to a database that includes definitions together with information as to when structures first appear, which system they are part of, and what they develop into. These features can be viewed at www.virtualhumanembryo.lsuhs.edu (Supported by NLM grant 5 RO1 LM07591-03.)

DANGERFIELD, Peter H.^{1,2}, Surendra BHANDI³, Nachiappan CHOCKALINGAM^{1,2,3}, Aziz RAHMATALLA³, and El-Nasri AHMED^{3,1}. ¹Faculty of Health and Sciences, Staffordshire University, Leek Road, Stoke on Trent, UK. ²Departments of Human Anatomy and Cell Biology and Musculo Skeletal Science, University of Liverpool, Liverpool, UK. ³Hartshill Orthopaedic Centre, University Hospital of North Staffordshire, UK. Assessment of the location of gravity line in scoliotic subjects during normal walking

While various studies highlight possible aetiological factors, the causes of adolescent idiopathic scoliosis (AIS) remain unclear. Research employing gait measurements indicate asymmetries in the ground reaction forces and suggest relationships between asymmetries, neurological dysfunction and spinal deformity. There is a paucity of information on dynamic balance during walking even though force platforms provide a good estimation of static balance. This investigation examined the location of centre of gravity (CoG) line during level walking in scoliotic subjects with different degrees of spinal deformity. Distortions to the normal location of centre of gravity line allow quantification of abnormal posture which might aid the assessment of surgical outcomes. Fifteen AIS patients scheduled for surgery within days after data collection were studied. A six camera movement analysis system and a strain gauge force platform were employed to collect kinematic and kinetic data. Kinetic data for the right and left foot was collected from separate trials of normal walking and the CoG estimated using the force and moment components from the force platform.

DANGERFIELD, Peter H.^{1,2}, Surendra BHANDI³, Nachiappan CHOCKALINGAM^{1,2,3}, Aziz RAHMATALLA³, and El-Nasri AHMED^{3,1}. ¹Faculty of Health and Sciences, Staffordshire University, Leek Road, Stoke on Trent, UK. ²Departments of Human Anatomy and Cell Biology and Musculo Skeletal Science, University of Liverpool, Liverpool, UK. ³Hartshill Orthopaedic Centre, University Hospital of North Staffordshire, Stoke on Trent, UK. Assessment of the location of gravity line in scoliotic subjects during normal walking.

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While various studies highlight possible aetiological factors, the causes of adolescent idiopathic scoliosis (AIS) remain unclear. Research employing gait measurements indicate asymmetries in the ground reaction forces and suggest relationships between asymmetries, neurological dysfunction and spinal deformity. There is a paucity of information on dynamic balance during walking even though force platforms provide a good estimation of static balance. This investigation examined the location of centre of gravity (CoG) line during level walking in scoliotic subjects with different degrees of spinal deformity. Distortions to the normal location of centre of gravity line allow quantification of abnormal posture which might aid the assessment of surgical outcomes. Fifteen AIS patients scheduled for surgery within days after data collection were studied. A six camera movement analysis system and a strain gauge force platform were employed to collect kinematic and kinetic data. Kinetic data for the right and left foot was collected from separate trials of normal walking and the CoG estimated using the force and moment components from the force platform. Results indicate differences across the subjects depending on the side of the scoliotic curve. Furthermore, the variables identified in this study can be applied to initial screening and surgical evaluation of spinal deformities. Further studies are being undertaken to validate these findings.

DE CARO, Raffaele, Ian G. PARKIN, Andreas WEIGLEIN, Teresa VAZQUEZ, Veronica MACCHI, and Jose SANUDO. Department of Human Anatomy and Physiology, Section of Anatomy, University of Padova, ITALY. Department of Human Anatomy and Embryology I. Complutense University of Madrid, SPAIN. Department of Anatomy, Cambridge University, UK. Institute of Anatomy, Medical University Graz, AUSTRIA. Course of specialisation in Clinical Anatomy of Neck and Shoulder.

In 2005 the department of Anatomy of Padova has organised a Course of Specialisation in Clinical Anatomy in cooperation with three European Anatomical Departments. The course is planned for 25 medical doctors, specialised in clinical anatomy, radiology, physiatry, orthopaedy, plastic surgery, neurosurgery, sporting medicine, anesthesiology and legal medicine. It develops in 3 working days organised into a theoretical and a practical parts for each anatomical district: A. Theory: anatomy and pathology, imaging, forensic pathology, anaesthesiology, rehabilitation and surgery (12 hours) B. Practice: the students are divided into three groups with reference to their specialisation; 1 group for legal medicine, 1 group for surgery and 1 group for physiatry (6 hours). The course has

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proposed to the medical doctors of Padova through the web site of the Medical Association of Padova and to the Italian Anatomists through the web site of the Italian Society of Anatomists. The course has received 50 pre-demands and 25 medical doctors have been selected: 10 legal medicine, 3 anatomists, 3 psychiatrists, 3 family doctors, 1 pathologist, 1 sporting doctor, 1 orthopaedic, 1 neurosurgeon, 1 plastic surgeon, 1 otolaryngologist. The course has been also been inserted into the Italian Program of Continuing Medical Education.

DEMIRYÜREK Deniz.², S. NASIR^{1*}, M.A. AYDIN^{1*}, N. KARAHANLI^{1*}, M.F. SARGON^{2*}, AND A. BAYRAMOGLU² ¹Suleyman Demirel University, Faculty of Medicine, Department of Plastic and Reconstructive Surgery, Isparta, TURKEY, ²Hacettepe University, Faculty of Medicine, Department of Anatomy Ankara, TURKEY. New microvenous anastomosis model in rats for microsurgical instruction: The external jugular vein.

We describe a new model for microvenous anastomosis, namely, the external jugular vein of rat. In 10 Wistar rats, the anatomy of external jugular vein was studied by dissection and histology. Anatomic dissection studies showed that external jugular vein has an average diameter of 1.9 mm without tendency to collapse. Light microscopy and scanning electron microscopy revealed a larger diameter and much thicker vessel wall with a prominent tunica media and adventitia compared to femoral vein and dorsal penile vein which was previously suggested as a model. Results of microanastomosis indicated 100 % patency rate immediately after the anastomosis for 10-0 and 8-0 nylon suture groups, respectively. 100 % and 90 % patency rates (9 of 10) were obtained 1 week after the procedure in two subgroups. The vein is easily dissected with naked eye without using operating microscope because it is the largest vein of rat with a thick vessel wall without tendency to collapse. Operation area permits training of bilateral microsurgical anastomosis using single skin incision contrary to other microvenous models. This new model is the best simulate the clinical procedure of microvenous anastomosis because it present similarities to human large diameter flap veins particularly.

DEMIRYUREK, Deniz². P. OZTAS^{1*}, G. GÜR^{1*}, M. POLAT^{1*}, B. YALCIN^{1*}, E. TAMER^{1*}, M. F. SARGON^{2*}, A. ZARARSIZ^{3*}, and N. ALLI^{1*}. ¹Ankara Numune Education and Research Hospital First Dermatology Clinic; ²Hacettepe University Faculty of Medicine Department of Anatomy; ³Ankara Nuclear Research and Training

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Center, Head of XRF Section, TURKEY. An aquired partial hair shaft anomaly.

We report a 7-year-old girl with a complaint of abnormality in her hair since three years. On her physical examination her complexion appeared rather pale. The hair was dull and different widths of the effected hair and a tattered appearance was observed . In the light microscopy, the atypical looking hair was flattened, in polarized light microscopy, the lateral sides of the hair shafts showed irregularity, confirming the irregular pattern on the light microscopy. Scanning Electron Microscopy (SEM) examination showed that the hair surface structure was abnormal and cuticle pattern was irregular with loss of cuticular cells. X-Ray Fluorescent (XRF) Study was performed and no abnormality was detected. The lead levels from both normal and affected hair were found to be high, while the serum lead and seruloplasmin levels were normal. Our findings were not consistent with any previously described hair deformity. The different lead levels between the healthy and tattered hair may be explained by precipitation of the pollutants on the fringes caused by abnormal cuticle cells.

DE RIVERO VACCARI*, Juan Carlos, Roderick A. CORRIVEAU*, and Richard H. WHITWORTH, Jr. Department of Cell Biology and Anatomy, Louisiana State University Health Sciences Center, New Orleans, LA. From micro to gross: the journey of a developmental neuroscientist into the world of gross anatomy.

Developmental cell biologists and neurobiologists work intensely to unravel molecular and microanatomical developmental processes and metabolic activities of different cell types. Their focus, albeit purposeful, is much narrowed. This report describes the successful journey of one developmental neurobiologist into the world of gross anatomy to acquire a much needed, more global perspective of personal research endeavors. A neuroscientist investigating neuronal development and a complete stranger to the realm of gross anatomy was offered the opportunity to take an advanced course involving dissection of the visual system including dissections of the orbit from superior and lateral views, as well as one demonstrating the entire visual pathway. The practice of gross anatomical dissection provides scientists with a unique experience that shows in a tangible form what others can only envision from three-dimensional pictures or cross-sections. Gross anatomical dissection allows for better understanding of the correlation between form and function, an essential factor for the practice of relevant science. Performing anatomical dissections and visualizing the larger picture of a

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particular area of the human body gives cellular and developmental researchers a better overall perspective of their research, allowing them to make better informed choices in their approach to expanding their research endeavors.

DODD*, Philip, Niket SONPAL*, Jerzy St. GIELECKI*[#], Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. [#]Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). Digital-image analysis of the radial artery with unusual variations found in a human fetus.

In the literature several anatomical descriptions of variations in the radial artery have been described. Herein, is a case report detailing dimensions and clinical significance of an anomalous bifurcation and reanastomosis of the radial artery proximal to the "snuff box". The anomaly was found within a spontaneously aborted female fetus 23 weeks old, which had been latex injected through the abdominal aorta, and dissected at the Medical University of Silesia in Katowice, Poland. Upon comparison of the vessels participating in the bifurcation with the normal radial artery (Angio-analyser 2005), descriptive data was obtained. Differences in volume were seen between the radial arteries and bifurcating branches (9.7 mm³ vs. 13.5 mm³). The proximal and distal angle of the bifurcation and reanastomosis measure 22.6 degrees and 17.4 degrees respectively, while the area covered by the bifurcation measures 15.1 mm². Knowledge of such deviations can be significant in daily procedures such as the obtaining of a radial pulse or during the procurement of vessels for more invasive procedures. Thus, it is of the utmost important to be aware of such variations prior to clinical procedures to prevent unexpected outcomes.

DOWNIE, Sherry A., Russell S. WHELAN*, Allen B. YEROUSHALMI*, Inga GUREVICH*, Mayra RODRIGUEZ*, Matthew D. RECKER*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Multiple vascular anomalies in the right femoral triangle: case report with clinical relevance to venous cannulation and obstetric surgery.

Significant anomalies of the right: deep femoral, medial circumflex femoral, inferior epigastric, deep external pudendal, and deep circumflex iliac arteries; and absence of the obturator artery, vein and deep femoral vein were observed in a 64-year-old male cadaver. All origins, pathways and branches of these vessels were normal on the left side. Principle among the right deep femoral artery variations

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were its origin from the anteromedial surface of the femoral artery and its pathway crossing superficial to the femoral vein at the cannulation site within the femoral triangle. The artery descended vertically, immediately superficial to the femoral vein, for approximately 2 cm then continued along the medial aspect of the vein to supply the adductors and the hamstrings via typical perforating branches. The artery also had two atypical branches. The first was the inferior epigastric artery that arose anterior to the femoral vein and ascended on the vein for 0.5 cm before passing deep to the inguinal ligament to assume its normal course. Collectively, the inferior epigastric and deep femoral arteries covered the distal 2.5 cm of the vein and would be pierced during an attempted femoral vein cannulation. The second atypical branch was an otherwise normal deep external pudendal artery. Lateral and medial circumflex femoral arteries originated from the femoral artery. The medial circumflex arose posteromedially, 5 cm distal to the inguinal ligament, and traveled 2 cm medially before bifurcating into descending and ascending branches. The descending branch supplied the adductor muscles and hip joint. The ascending branch passed deep to the pectineus muscle, and supplied adductor brevis and obturator externus muscles before *entering the obturator foramen to supply internal pelvic surfaces*. An aberrant vein drained the entire field supplied by this artery and emptied into the medial circumflex that joined the femoral vein. No right obturator vessels were present. There was also no deep femoral vein. Finally, the deep circumflex iliac artery arose abnormally from the femoral artery. It passed superolaterally across the femoral nerve then deep to the inguinal ligament to assume its normal course. Knowledge of the variations reported here is important to physicians who routinely access the femoral vein and to surgeons because of the variant medial circumflex femoral vessels that functionally replaced the obturator vessels. The findings presented here underscore the value of cadaveric dissection in anatomical education and clinical research.

DOWNIE, Sherry A., Mayra RODRIGUEZ*, Inga GUREVICH*, Matthew D. RECKER*, Russell S. WHELAN*, Allen B. YEROUSHALMI*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Bilateral persistent median arteries: case study and literature review. Large bilateral persistent median arteries (PMAs) passing through the carpal tunnel were identified on a 64-year-old male cadaver. The diameter, pathway, and branching pattern of right and left PMAs were virtually identical. Both PMAs originated as branches of the

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ulnar artery distal to the interosseous branch, and traveled on the deep surface of the median nerve in a common sheath. Each median nerve had a "high-bifurcation" several cm proximal to the transverse carpal ligament. The PMAs emerged ventrally, through this bifurcation, to become the superficial-most structure within the carpal tunnel. The right and left PMAs differed in that the right branched into common palmar arteries *within* the carpal tunnel while these arteries originated distal to the transverse carpal ligament on the left side. Both PMAs provided circulation to the lateral 2_ digits of the hand, while the ulnar arteries supplied the medial 2_ digits. In neither hand did the median and ulnar arteries form a complete superficial palmar arch. The radial arteries were significantly reduced in size and neither had identifiable superficial palmar branches. In addition, several musculotendinous anomalies were identified in the right forearm: a tendinous sling on the deep surface of the FDS suspending the sheath containing the median nerve and PMA, a tendinous connection between FDS and FDP, and the insertion of palmaris longus muscle into the transverse carpal ligament. Finally, clinically significant vascular anomalies were present in the right femoral triangle and are reported in a separate abstract. A review of the PMA literature yielded disparate findings with respect to incidence and related clinical problems. It has been associated with the development of carpal tunnel syndrome and with complications during forearm, wrist and hand surgeries. The findings presented here underscore the value of cadaveric dissection in anatomical education and clinical research.

DUNCAN, Olivia, Aimee McINTYRE, and Stuart W. McDONALD. Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK. Variations in the branches of the suprascapular nerve to the supraspinatus and infraspinatus muscles.

Other workers have reported that a single branch of the suprascapular nerve to supraspinatus divides into two, and that infraspinatus receives 2-4 branches. We dissected the suprascapular nerve in 6 cadavers (12 shoulders). In the supraspinous fossa or at the superior transverse scapular ligament, the suprascapular nerve bifurcated. One branch continued to the infraspinous fossa and the other supplied supraspinatus. The latter mostly split into 2 terminal motor branches but 1 specimen showed it dividing into 3 terminal branches. In 1 shoulder, 2 branches to the muscle arose separately from the main nerve. The branch that entered the infraspinous fossa gave off 2 – 5 branches to infraspinatus. In 3 shoulders, the branching occurred at the spinoglenoid notch but in the others it was

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closer to the muscle. The specimens showed left-right asymmetry in their branching patterns. There was no significant difference between the widths of the two terminal branches to supraspinatus and the primary branches to infraspinatus.

ELIOT, David J., Glenn DAVIS*, and Walter C. HARTWIG*. Touro University College of Osteopathic Medicine, Vallejo, CA. “Round robin” peer instruction in the anatomy laboratory (grade analysis and student survey).

Stimulating interaction between learners is an important element of anatomy education. The TUCOM anatomy laboratory experience includes peer instruction that is modified from the Western States Chiropractic College “Round Robin” (RR) protocol. Notable features of RRs include: emphasis on oral instruction; focus on specific topics; much student participation with little administrative effort by faculty; simple, flexible logistics; and quiet faculty. At the beginning of the semester each student is assigned to present three five-minute oral RR presentations on a specific date. On RR days, groups of students rotate to see three or six of the thirteen different presentations being given. Most presenters show their recent dissections; some discuss radiographs or osteology. There is no formal evaluation. Laboratory and theory examination scores of RR presenters did not differ significantly from scores of students who were assigned to present their RRs in one of the semester’s other two blocks. 72% of students surveyed in spring 2005 agreed or strongly agreed that RRs “are an excellent way to learn anatomy.” Most students found an appropriate level of knowledge and few mistakes in RRs. Popular recommendations for change included: more faculty guidance, ungraded evaluations by faculty, more clinical RRs, and RRs in other courses.

FEIGL Georg, Barbara WENINGER*, Walter ROSMARIN*, Christian DORN* and Rudolf LIKAR*. Department of Anatomy Graz, Department of Anesthesiology and Pain Therapy, Hospital Graz, and Department of Anesthesiology and Intensive Medicine, LKH Klagenfurt, AUSTRIA. Block of the suprascapular nerve- quo vadis liquore?

Different approaches exist for the block of the suprascapular nerve and volumes of local anesthetics from 2-15 ml are used. We compared the spread of two volumes of local anesthetics, 10ml and 5ml, with the aim of a possible reduction of volumes. In addition, the skin-bone distance during the block was documented for verifying normal and critical distances. To perform the block, a lateral

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approach was chosen. 35 cadavers on both sides were investigated. 10ml of solution were injected on 35 right sides (group A), group B is represented by 35 left sides with a volume of 5ml. The solution was a diluted computerized tomography (CT) contrast. Immediately after injection, all cadavers were investigated by CT- scans and 3D-reconstruction to document the dissemination. 5 sides of each group were injected with colored contrast medium and dissected after CT-investigation. Results indicated that Group A showed a distribution to the entire supraspinous fossa in all cases and was pressed out of the suprascapular notch in 4 cases with a maximal extension into the axillary fossa in 2 cases. In group B, the supraspinous fossa was filled in 24 cases, with a maximal extension to the axillary fossa in two cases. In 9 cases, the contrast agent kept in the lateral half of the supraspinous fossa. In one case we had a medial spread and in another case a superficial spread with displacement of the needle. The skin- bone distance ranged between 2cm and 7cm. We concluded the use of 5ml is enough to fill the supraspinous fossa and to reach the suprascapular nerve when entering the anatomical compartment. Outrunning the distance of 7cm, one should think to stop the block.

FERGUSON^{1*}, April, Rae Lynne KINLER^{1*}, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Mapping the contributions of the furcal nerve.

Lumbosacral radicular symptoms may involve the furcal nerves especially when they present with atypical neurologic symptoms and the responsible level cannot be assessed. In order to understand better, the pathophysiology of the lumbosacral radicular syndromes, we examined the furcal nerve. 200 formalin fixed cadavers were examined during the years of 2003-2005. The connections between the lumbar plexus and the sacral plexus were examined bilaterally. In 80% of the cases the plexuses were joined by a single furcal nerve. The single furcal nerve was formed by L4 in 80% and L5 in 10% of cases. The doubled furcal nerve (15%) arose from L3 and L4 in 50%, from L4 and L5 in 30% and from L3-L5 in 20% of cases. The furcal nerve divided variably into anterior, intermediate and posterior root fibers. Usually, the anterior and intermediate parts of furcal nerve arising from L4 traveled to join the lumbar plexus (femoral and obturator nerve), and those from L5 continued to the lumbosacral trunk. In 5% of cases no connection between the plexuses could be found. These data could be prove useful in evaluating the etiology of lumbosacral radicular syndromes.

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FIRBAS, Ulrike*, Stefan MENG*, Silvi U. G. WENINGER*, Wolfgang J. WENINGER*, and Wilhelm FIRBAS. Krankenhaus Rudolfstiftung, Vienna, Integrative Morphology Group, Medical University Vienna. In vivo examination of the connective and adipose tissues in the orbital apex and superior orbital fissure.

Precise knowledge of the topography of the connective tissue spaces located in the orbital apex region is essential for exact diagnosis and prognosis of orbital apex and superior orbital fissure lesions as well as planning of surgical interventions. However existing anatomical and radiological data are scant and contradictory. Using multislice computed tomography, this presentation aims to provide topological descriptions of the orbital apex region near the superior orbital fissure, focusing on connective tissue compartments, which are connected to extra-orbital spaces. In the lower part of the orbital apex we identified in 94% of our patients (in 83% bilateral) a compartment, which was filled with adipose tissue continuous with the adipose tissue of the pterygopalatine fossa. In 80% this compartment also protruded into the middle cranial fossa through the lower medial part of the superior orbital fissure. A second compartment located immediately beneath the cranial nerves III, IV, V1, and VI and expanding into the middle cranial fossa, was identified, at least unilaterally in 60%. We provide exact qualitative and quantitative analysis of these compartments and discuss their clinical relevance.

FITZSIMMONS John M., Gillian BICE, Bina VORA, Marios LOUKAS, and Dennis GILLILAND*. Department of Radiology and Department of Statistics, Michigan State University, MI and Department of Anatomy, American University of the Caribbean, Sint Maarten NETHERLANDS ANTILLES. Student responses to the cadaver lab.

The gross anatomy course for first year medical students is a course that may cause great anxiety, not only because of the vast content of the course, but also simply because it may be the first time many of these students are encountering a dead human body. Some reports suggest that there is a strong negative response to the cadaver lab experience. We have chosen to assess this phenomenon at Michigan State University and the American University of the Caribbean by administering a survey to our first year medical students at the beginning of their lab experience. The intent is to determine if there are negative emotional and/or physical responses to the lab. We are also assessing if there is any difference in the way students at these two schools respond. MSU has a prosection anatomy course and the AUC has a full dissection course. Do

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students that have chosen a dissection program respond differently to the cadaver lab than those that have chosen a school that offers a prosection lab? Our data suggest that there is a difference in how these two populations feel about the cadaver lab. We offer explanations for our findings, and suggestions regarding what might be done by the faculty, if anything, to make the cadaver lab a more positive experience for all students.

FOGG, Quentin A.^{1,2}, Gregory I. BAIN^{3*}, and Raymond A. TEDMAN^{2,4*}. ¹Department of Anatomy and Histology, American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Department of Anatomical Sciences, the University of Adelaide, Adelaide, South Australia, AUSTRALIA; ³Modbury Public Hospital, Adelaide, AUSTRALIA; ⁴Department of Anatomy, Griffith Medical School, Griffith University, Gold Coast, Queensland, AUSTRALIA. Ligamentous support of the scaphoid and its influence on carpal motion theories.

The ligamentous support of the scaphoid is not clearly defined. Variation of scaphoid motion has been reported biomechanically, so this study attempts to identify anatomical reasons for the variable motion. Embalmed cadaveric wrists (n = 55) were dissected to identify patterns of ligamentous support for the scaphoid. The ligaments were digitally measured using Image J. The dimensions and angulation of each ligament were measured. Previously established radiologic differences between individuals were used to divide the sample population into two groups. The measures were then used to identify statistically significant differences (p < 0.05) between the two groups. The ligamentous patterns observed were distinctly different between the two groups and were designated pattern one (n = 32; 58.2%) and pattern two (n = 23; 41.8%). Pattern one suggests that rotation of the scaphoid about its longitudinal axis and ulnar translation against the capitate would be supported. Pattern two suggests flexion and extension would be supported. These data, combined with other sources, clearly suggest variable patterns of scaphoid motion between individuals, prompting reconsideration of surgical methods of repair of the wrist. It is proposed that better understanding of these anatomical variations may improve understanding of scaphoid mechanics and may facilitate improved treatment of wrist dysfunction.

FREEMAN^{1*}, A. Jay, Nathan A. JACOBSON^{1*}, Marios LOUKAS^{1,2}, and Quentin A. FOGG^{1,3}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School,

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Boston, MA. ³Department of Anatomy and Histology, Flinders University, Adelaide, AUSTRALIA. Functionally significant variations of the pes anserinus and the clinical implications for tendon grafting and tibial compartment syndromes.

Current clinical literature cites the importance of the tendons forming the pes anserinus for providing adequate tendon grafts. This study attempts to clarify the anatomical relationships of these tendinous attachments. Cadaveric legs (n = 42) were dissected, photographed and measured. The proximal attachment of each tendon was identified and recorded for each specimen. Tendinous bands from the sartorius and gracilis muscles were observed in all specimens, whilst variable bands from the semitendinosus muscle were observed and designated ST1, ST2, ST3 or ST4. The ST1 (proximal) and ST4 (distal) bands were observed in all specimens, whilst ST2 and ST3 were not. In all specimens the ST4 band extended anteriorly and laterally to contribute to the crural fascia, and into the anterior compartment of the leg. These data suggest that the ST4 band should normally provide adequate length for most grafting procedures currently reliant on multiple hamstring grafts. Furthermore, the attachment to the crural fascia may indicate a hamstring contribution to tibial compartment syndromes. Tightness or overuse of the hamstrings may therefore actively increase intra-compartmental pressure within the leg. Significantly, this may result in a tibial compartment syndrome with no overuse or dysfunction evident in the leg.

FRICK*, Steve, & David J. PORTA. Department of Anatomy, University of Louisville School of Medicine, and Department of Biology, Bellarmine University, KY. The effects of combined torsion and bending loads on fresh human cadaver femurs.

Injuries to long bones often result from more than one force. This work explores the fracture patterns that result from different percentages of combined torsion and bending loads on 18 matched pairs of fresh human femurs. A specialized machine was constructed for this project that was capable of delivering a measured impact to the long axis of the specimen while also imparting and recording torsion. Force and torque transducer data were captured (sampling rate 10 KHz) and uploaded to a computer for storage and analysis. Tests were recorded on digital high speed video at up to 8,000 frames/sec. One femur from each pair was torqued to failure. The mate was placed in one of two groups to be subjected to combined loads. One group was twisted to 30% of the maximum torque of its match then simultaneously impacted with an

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instrumented steel pipe at approximately 9 m/s. In the second group each femur was torqued to 70% before it was impacted. All of the pure torsion tests resulted in spiral fractures as expected. The specimens in the low torque group exhibited fracture patterns associated more with bending, while those in the high torque group showed patterns more spiral in nature.

GASSER, Raymond F. Louisiana State University Health Sciences Center, School of Medicine, Department of Cell Biology and Anatomy, New Orleans, LA. Evidence that migration during embryogenesis is unnecessary in events traditionally considered to be migratory.

Using serially sectioned and reconstructed mammalian embryos the study examined whether or not the changing positions of structures could be explained by expansile growth and shape change rather than from migration. Four events were examined in which migration has been the traditional explanation of the movements observed; 1) mesoderm formation from primitive streak, 2) sclerotome formation from somite, 3) spinal ganglion formation from neural crest, and 4) parathyroid, thyroid and thymus gland formation from pharyngeal endoderm. Embryos dramatically change in size and shape during the period when migration is supposed to occur. Surface or near surface reference points were used previously to determine migration but these points also move. In the present study more stable internal reference points were used. Significant was the use of identical magnifications for each reconstructions series making it possible to equate each one to a frame of a motion picture film. Rather than the structures moving from one region to another (i.e., migration), the study showed that they remain in the same region and change positions as the region expands, changes shape and undergoes local cell proliferation (i.e., growth movements). The findings suggest that other migratory events should be reexamined.

GASSER, Raymond F. and R. John CORK. Louisiana State University Health Sciences Center, Department of Cell Biology and Anatomy, New Orleans, LA. The microscopic morphology of human embryo sections on computer disks.

The microscopic morphology of the best stage 1 through 23 human embryos in the Carnegie collection is becoming available on CDs and DVDs. The effort, called DREM (Digitally Reproduced Embryonic Morphology) is part of the Virtual Human Embryo Project. Samples of the completed databases of stages 1 through 13 will be presented. Each database has four sections; Introduction, View 3D,

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Scan, and Browse. The Introduction gives histological and historical information on the specimen (s), features of the stage and relevant publications. View 3D includes animations of 3D reconstructions. In Scan Mode the aligned section images are displayed as flythrough animations. Browse is the major portion of the databases that displays the microscopic morphology of the section images up to 500X. Each zoom level is accompanied by a moveable measuring bar. Structures at zoom level 1 have labels which can be turned on or off. All the section images for each specimen are available as ZIP files or individual JPEG images. The CD and DVD versions of the databases differ only in the number of high magnification section images. All of the images on the disks can be off loaded for use in presentations and publications provided their source is acknowledged. Further details are available at www.virtualhumanembryo.lsuhs.edu (Sponsored by NICHD grant #5RO1 HD 37811.)

GASSER, Raymond F. and R. John CORK. Louisiana State University Health Sciences Center, School of Medicine, Department of Cell Biology and Anatomy, New Orleans, LA. Morphology of the preimplantation stages of human embryos.

Databases of the microscopic morphology of human embryos of stages 1 to 3 are now available on CDs and DVDs. The databases include serial sections from embryos in the Carnegie collection supplemented with micrographs of in vitro specimens. Stage 1 is the unicellular embryo with an approximate postovulation age (POA) of one day and a diameter of approximately 0.1 mm. It is divided into three substages: 1a) penetrated oocyte with formation of the second polar body, 1b) pronuclear stage and 1c) mitotic spindle where the maternal and paternal chromosomes come together (syngamy) to form the zygote prior to cleavage. Stage 2 (POA; 2-3 days) begins with division of the zygote into two cells and ends with the appearance of the blastocystic cavity. Cleavage divisions do not occur synchronously so embryos are comprised of anywhere from one to sixteen blastomeres. On day 3 in vitro compaction begins and lasts for about one day. The embryo changes from a collection of individual cells into a smooth mass with indistinguishable cell boundaries. Stage 3 (POA; 4-5 days) begins when a cavity first appears and ends when the embryo makes contact with the endometrium. Blastomeres separate into outer trophoblast cells and an inner cell mass. The expanded blastocyst breaks through the zona pellucida (hatching) prior to implantation. (Sponsored by Grant No. #5RO1 HD 37811 from the National Institute of Child Health and Human Development.)

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GEST, Thomas R., William E. BURKEL, and Gerald W. CORTRIGHT. Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI. A proposal for logical and consistent anatomical nomenclature for cutaneous nerves of the limbs.

The system of anatomical nomenclature needs to be logical and consistent. However, variations in translation to English of the Latin and Greek terminology used in Nomina Anatomica and Terminologia Anatomica have led to some inconsistency in the nomenclature of cutaneous nerves in the limbs. An historical review of cutaneous nerve nomenclature reveals that there are two general naming conventions: one primarily British and one primarily American. The American convention presents cutaneous nerves of the limbs in the format "medial brachial cutaneous nerve", while the British convention presents the same nerve as "medial cutaneous nerve of the arm", thereby translating "brachii" to "of the arm". If logically and consistently applied throughout the body, the British convention would rename the sural nerve to the "nerve of the calf", the brachial artery would become the "artery of the arm", the femoral nerve would be "nerve of the thigh", and femur would be "bone of the thigh" or "thigh bone". The British convention leads to many other nomenclatural inconsistencies, which would seem to make learning anatomy more difficult for the beginning student. In this era of contracting anatomy curricula, every effort should be made to keep anatomical nomenclature simple, logical, and consistent.

GEST, Thomas R., William E. BURKEL, Gerald W. CORTRIGHT, Geraldine DURKA-PELOK*, Tamara STEIN*, Dana ARONSON*, Tashfeen EKRAM*, Okeoma MMEJE*, Charisa ROY*, Robyn SACKYFIO*, Kirsten SALMEEN*, and Danielle TURNER*. Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI. Learning modules and games as substitutes for anatomy lectures.

We have abandoned the typical hour-long lecture format in gross anatomy in favor of a reduced lab overview presentation. Some of the didactic material previously presented in lecture format has been converted to web-based learning modules. These learning modules present foundational topics in a traditional programmed learning format. A brief panel of text with supporting visuals is followed by a question. Students proceed through the module by correctly answering each question. At the completion of each module, students may download a computer-based game. These games focus on the module topic and are delivered in a format called "Who

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wants to be a millionaire doctor". Other games, called "Anatomy Jeopardy", give students a multi-player review of multiple anatomical topics. Both games are based on PowerPoint and are fairly easy to build. A web-based javascript version of the millionaire game is also available. The learning modules and their associated games have been very well received by the students, and we have succeeded in converting many passive learning lecture hours into an active learning format that is completely self-paced.

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

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

GIELECKI*[#], Jerzy St., Anna ZURADA* and Niket SONPAL*., Department of Anatomy, Medical University of Silesia, Katowice, POLAND. [#]Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (Sponsored by S. W. Carmichael). Computer based learning – the future to supplementing the 21st century student.

Repetition and visualization are the keys to understanding the curriculum of gross anatomy. In addition to atlases and cadavers the present day student also relies on computer based programs. At the Medical University of Silesia, an interactive supplemental CD-ROM

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was developed to aid students in their study of osteology and joint kinematics. The CD-ROM program was titled Interactive Anatomical Atlas – Osteology. This is the first in a series of “learning modules programs”, that will be developed. Within the program students have the option of exploring the skeletal system by topographical region or by radiological images, in Polish, English, or Latin. There is a tutorial option in which the program will voice the structure in question, and allow a moment for repetition by the student. Finally the program offers the option to have an interactive pin test, in which structures can be named or keyed in. During a recent survey of students preferences in the study of anatomy, computer programs were ranked 3rd by 1st year students behind atlases and cadavers as a thorough means of studying anatomy. Implying that new age technologies have quickly risen as a means of teaching and should be further implemented as a supplement to the gold standard of cadaveric study.

GRANGER, Noelle A., Diane C. Calleson*, and Jennifer M. Burgoon. Department of Developmental and Cell Biology, Department of Family Medicine and the School of Public Health, and the School of Education, University of North Carolina, Chapel Hill, NC. Are dissection videos and other web-based materials an effective substitute for actual dissection in a medical anatomy curriculum?

Pressure to reduce dissection time in our medical anatomy course has led to the development of web-based instructional tools. These tools include: 1) videos of dissections of the human body; 2) labeled radiographs, CT scans, and MRIs; 3) stacked sectional images from the Visible Human Project with associated text; 4) links to Netter plates; 5) self-evaluations; and 6) a glossary. Besides the development of these instructional tools, we are evaluating whether these tools help students prepare for dissection and exams more effectively, as well as influence exam scores. We are also evaluating whether these tools are an effective substitute when the students dissect during alternate laboratories, with only half the students dissecting at any one time. Data collection methods include student pre- and post-use surveys and analysis of grades for practical and written exams. We performed descriptive, bivariate, and regression analyses, and identified themes in the qualitative data. Students ranked this program highly for its usefulness, especially the dissection videos for laboratory preparation. Exam scores from last year, when students dissected all the time, are being compared with those from this year, when only half the students dissected each time, using the same practical and written exams. (Sponsored by the Fund for the Improvement of

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Postsecondary Education, U.S. Department of Education).

GRIMMOND*¹, Judith, Magdalena KWIATKOWSKA¹, Justin LIEGMANN*¹, Rafal CHMIELEWSKI^{1,2} (1,2), and Marcin KWIATKOWSKI*². ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine, St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Warsaw, POLAND. Morphometry of the fourth ventricle.

The fourth ventricle is located in the center of the posterior cranial fossa. It is connected to the third ventricle superiorly by the cerebral aqueduct and to the central canal of the spinal cord inferiorly. The floor of the fourth ventricle is made by the pons and the medulla oblongata. The roof is made by the superior medullary velum, lingula, cerebellar peduncles, inferior medullary velum, tela choroidea, nodule and uvula. Operative access to the fourth ventricle can only be obtained by splitting the cerebellum or by operating through a series of complex fissures between the cerebellum and the brainstem. The purpose of the study was to examine the fourth ventricle diameters according to special anatomical landmarks. 30 human cadaveric brains were perfused with 10% formaldehyde solution. All 30 were then cut into three orthogonal planes: sagittal, frontal and transverse, creating a total of 93 sections for measurement. Pictures of the sections, in which a scale was included, were taken using a Sony digital camera and measurements done using the Multi Scan Base software. The length of the fourth ventricle was measured from the superior opening of the central canal of the spinal cord to the beginning of the aqueduct using the slices cut in the sagittal and frontal planes. The range was 1.07cm to 3.90cm with a mean of 1.30cm. The height of the fourth ventricle from the rhomboid fossa to the fastigium was measured on the slices cut in the sagittal plane. The range was 0.54cm to 1.25cm with a mean of 1.00cm. Two other measurements using frontal plane sections were made; the first was the rhomboid fossa for length (as reported above) and distance between right and left lateral foramina of the fourth ventricle. The measured values had a range of 1.06cm to 2.86cm with a mean of 2.14cm. The second measurement was done on the roof of the fourth ventricle. The distance between the right and the left middle cerebellar peduncles were recorded. The range was from 1.14cm to 3.73cm with a mean of 2.00cm. We hope our results can be useful for the neurosurgeons operating in this small area in certain clinical cases, such as ventricular system shunting or operating tumors in the fourth ventricle and the brain stem.

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GRIMMOND*¹, Judith, Magdalena KWIATKOWSKA¹, Justin LIEGMANN*¹, Rafal CHMIELEWSKI^{1,2} (1,2), and Marcin KWIATKOWSKI*². ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Warsaw, POLAND. The atlantal part of the vertebral artery.

The vertebral arteries (VA) are the branches of the subclavian arteries. They run up through the foramina of the transverse process of the cervical vertebra. In the area of the suboccipital triangle the vertebral artery arches around the atlas to reach foramen magnum and finally in the cranial cavity it forms the basilar artery (BA). The purpose of this study is to examine the part of the VA located inside the suboccipital triangle. The material comprised 20 suboccipital triangles removed from the human cadaveric specimens. All these specimens were perfused with 10% formaldehyde solution for 3 months. The dissection was made using microsurgical instruments. The VA pictures were obtained by the digital camera, and measurements were done with of Multi Scan Base software. The atlantal part of the VA was divided into 5 parts: foraminal (Fs), sagittal (Ss), transverse (Ts), medial condylar (MCs) and dural (Ds). The length of these segments was measured on the right and left sides and the obtained results are following: Fs: (0,52-1,1)0,82-on the right side and (0,51-1,16)0,87 on the left side. Ss: (0,51-1,15)0,82-on the right side and (0,45-1,27)0,87 on the left side. Ts: (0,86-2,3)1,25-on the right side and (0,93-1,93)1,28 on the left side. MCs: (0,62-1,59)0,95-on the right side and (0,66-1,59)0,89 on the left side. Ds: (0,17-0,63)0,42-on the right side and (0,29-0,62) 0,44 on the left side. The diameter of VA was measured on the right and left sides in 3 points: The results are following: 1. (0,25-0,66)0,39 on the right side and (0,23-0,96)0,42 on the left side; 2. (0,35-0,54)0,43 on the right side and (0,27-1,12)0,46 on the left side; 3. (0,23-0,51)0,37 on the right side and (0,16-2,05)0,53 on the left side. The distance between VA and mastoid process on both side of the skull was also measured. On the right side it was (1,16-2,12)1,85cm, whereas on the left side (1,46-1,96)1,75cm. The distance from C1 tip to mastoid process tip was also estimated. On the right side it was (1,71-3,36)2,16cm, on the left side (1,38-3,42)2,79cm.

GRIMMOND*¹, Judith, Magdalena KWIATKOWSKA¹, Justin LIEGMANN*¹, Rafal CHMIELEWSKI^{1,2} (1,2), and Marcin KWIATKOWSKI*². ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine Sint.

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Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Warsaw, POLAND. The schema of the basilar artery branches to the pons.

The vertebrobasilar junction is the place of union between the two vertebral arteries and the point of origin of the basilar artery (BA) as a consequence of this junction. The BA typically runs along the basilar sulcus of the pons to finally bifurcate and terminate as the right and left posterior cerebral arteries. Many studies the last centuries have examined the exact place of origin of the BA, the termination patterns, as well as the branching patterns of the BA. The branches of the BA include: the Superior Cerebellar Artery (SCA), Anterior Inferior Cerebellar Artery (AICA) and many unnamed perforating branches. The purpose of this study was to classify the morphology, topography and clinical anatomy of the basilar artery (BA) branches to the pons (pontine branches). The investigation was performed in 100 cadaveric brain specimens injected with colored latex. The anatomy of the cerebellar arteries: the SCA, the AICA, the MICA (pontine part), the large pontine vessels originating from and their contribution towards intrapontine vascularization were studied. Each vessel was numbered counting from the PCA to VA (except for the SCA and the AICA) for establishing the precise localization of every type of vessel on the basilar artery course and to catch the regularities in their entity. The evaluation of the average distances between the vessels origin was performed. These results enabled for establishing the schema of the basilar artery branches to the pons. As the conclusion of our study we prepared the schema of the basilar artery branches to the pons. This pattern shows the general arrangement of the types of vessels on the BA's course that was most frequently observed in our specimens. This pattern may be useful for neurosurgeons operating in this area especially in the cases when decision of branch occlusion must be undertaken; we also hope that the knowledge of the average distances between the branches origin from the basilar artery trunk may turn out to be important for minimally invasive neurosurgery.

GRIMMOND*¹, Judith, Magdalena KWIATKOWSKA¹, Justin LIEGMANN*¹, Rafal CHMIELEWSKI^{1,2} (1,2), and Marcin KWIATKOWSKI*². ¹Department of Anatomy and Embryology, American University of the Caribbean School of Medicine St. Maarten, NETHERLANDS ANTILLES. ²Department of Anatomy, Biostructure Institute, Warsaw Medical University, Warsaw, POLAND. Morphometry of the cerebral aqueduct.

The cerebral aqueduct has a special role within the ventricular

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system. It joins the third and fourth ventricles together. It is the narrowest part of the ventricular system. For this reason, it may quickly become occluded during certain pathological and traumatic events. The cerebral aqueduct is a specialized component of the ventricular system. It is a narrowed region that acts as a bridge between the third and fourth ventricles, and allows the passage of CSF between the ventricular compartments. This narrowing may result in occlusion during certain pathological and traumatic events, including tumor growth, and subarachnoid hemorrhage. The aforementioned conditions make the cerebral aqueduct a structure of great clinical significance. The purpose of this study was to measure the diameters of the aqueduct of several specimens. For this study, 30 human cadaveric brains were perfused with 10% formaldehyde solution. All 30 were then cut into three orthogonal planes: sagittal, frontal and transverse, creating the slices used for measurements. Pictures of the sections, in which a scale was included, were taken of the sections using a Sony digital camera and measurements done by using the Multi Scan Base software. The length of the aqueduct from the third to the fourth ventricle on slices cut in frontal and sagittal plane sections measured 1.21cm to 2.40cm with a mean of 1.66cm. Two other measurements were made on transverse plane sections of the aqueduct. The AP diameters of the aqueduct ranged from 0.13cm to 0.97cm and had a mean of 0.32cm, whereas the left to right lateral diameter had a range of 0.16cm to 0.74cm with a mean of 0.35cm. Our results show that certain portions of the aqueduct in particular, those located half-way between the fourth and third ventricle may be as narrow as 0,13 cm. This confirms clinical findings that the aqueduct is most often occluded in this part of the ventricular system.

GUPTA* Yuri, Mia MORGAN*, Annika SINGH*, and Harold ELLIS. Dept of Anatomy, Cell and Human Biology, GKT School of Biomedical Sciences, Guy's Campus London Bridge, London, UK. Junior doctors' knowledge of applied clinical anatomy.

This study examines the level of knowledge of applied clinical anatomy among junior doctors. A self-report multiple choice questionnaire was designed covering 15 areas of anatomical knowledge essential to clinical practice, e.g. important surface landmarks and interpretation of radiographs. 150 subjects were invited to complete the questionnaire (response rate 84.6%). Responders consisted of anatomy demonstrators, house officers, senior house officer and registrars across the range of medical and surgical specialities. Answers were scored and analysed by group,

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allowing comparison not only between newly qualified house officers and more senior doctors, but also with anatomy demonstrators who have undergone more traditional anatomical training. The results reveal a wide variation of knowledge among junior doctors, who scored an average of 74%, versus registrars (79%) and demonstrators (83%). This progression in knowledge up the clinical hierarchy perhaps reflects that clinical experience provides a superior education in applied anatomy compared to medical school, although with demonstrators topping the league table, it seems that rigorous academic training is the most beneficial. With junior doctors' training in the UK currently in flux these results highlight the need for training in clinical anatomy to hold a coveted place in the development of tomorrow's clinicians.

HALLNER*¹, Barry, Robert G. LOUIS Jr. ^{1*},** and Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
Mapping the nerve to the levator ani and its relevance in pelvic floor abnormalities.

Abnormalities in the structure or function of the levator ani muscle (LA) have been implicated in the development of pelvic organ prolapse, sexual dysfunction, several chronic pelvic pain syndromes, voiding and defecatory dysfunction, and urinary/fecal incontinence. The aim of this study was to describe the innervation of the LA muscles in both males and females. Two hundred dissections of the sacral plexuses were performed in 100 formalin fixed cadavers (aged, 58-86 years, Female 42, Male 58) with the use of transabdominal, gluteal, and perineal approaches. Both the pudendal nerve and the sacral nerve roots were followed from their origin at the sacral foramina to their termination. Pelvic floor innervation was described with reference to fixed bony landmarks, particularly the coccyx, the ischial spine, inferior pubis and the different parts of LA muscle. LA muscles were innervated primarily by a nerve, which originated from the sacral plexus and coursed along the pelvic surface of the pelvic floor muscles to be distributed to the iliococcygeous, pubococcygeous and puborectalis. The nerve to LA was classified according to its nerve component into the following categories: Type I (50%) LA originated from S4 and S5, Type II (19%) LA originated from S3, Type III (16%) LA originated from S4, Type IV (11%) LA originated from S3 and S4 and Type V (4%) originated from S3, S4 and S5. All LA variants were inserted to LA in different points. Furthermore, the pudendal nerve originated from the S2 to S4 foramina and did not innervate the LA in the pelvis.

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However, in 72% of the specimens the pudendal nerve did provide a distinct branch through the inferior rectal nerve that innervated the rectal attachments of puborectalis. Our results suggest that the LA muscle is innervated mainly, by branches of S3, S4 and S5, which travel on the superior surface of the pelvic floor, and partly, by the pudendal nerve at the inferior external surface of the pelvic floor.

HARRIS^{1*} Christine, Michael T. BROAD^{1*}, Stuart W. McDONALD²,
¹Glasgow Dental School, ²Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK. Anatomy and removable prosthodontics.

At the University of Glasgow dental students dissect the head and neck before commencing clinical dentistry. We found that students were unfamiliar with several intra-oral features when they started prosthodontics. We hope our demonstration of the importance of these anatomical landmarks will be of interest to anatomists without dental qualifications who teach on dental courses. The extent of dental trays and prostheses are defined by the external oblique ridge, frenal attachments, lingual pouch/ retromylohyoid area, pear-shaped pad, retromolar pad, hamular notch, peripheral or vestibular sulcus and the maxillary tuberosity. The junction of the soft and hard palates is known clinically as the *vibrating line* and is the posterior limit of an upper prosthesis, which must not cover the palatine fovea, the ostia of palatine glands. Palatine and mandibular tori may be troublesome in the manufacture of dental prostheses. In the UK, dental science and practice are becoming more integrated in curricula, and anatomists and clinicians need to work together to ensure that terminology and applications of knowledge are understood.

HAYWARD* Katy, John BRIDGER, and Ian G PARKIN. University of Cambridge Anatomy Department, Cambridge, UK. Shoulder joint arthropathy: which comes first - rotator cuff tear or acromioclavicular arthritis?

Rotator cuff tears lead to glenohumeral arthropathy of a varying degree. A study was made of the 80 shoulder joints of cadavers aged between 60 and 103 at the University of Cambridge. The majority of shoulders had arthritis of the acromioclavicular joint and osteophyte formation inferiorly. The anatomical relationship is such that these osteophytes could impinge on the supraspinatus tendon within the capsule at a specific point. Shoulders with acromioclavicular arthritis showed varying degrees of wear of the supraspinatus tendon, extending to fully developed arthropathy with the

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head of the humerus articulating with the under surface of the acromion. In all cases of severe glenohumeral arthropathy there was rupture of the long head of biceps, which then attached to the upper end of the bicipital groove. It is suggested in this paper that the primary pathology of rotator cuff tear arthropathy in the elderly is acromioclavicular osteophytic formation and not a tear of the rotator cuff, which may be the cause in a younger population.

HEBDA*, Anna, Niket SONPAL*, Jerzy St. GIELECKI*[#], Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. [#]Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). Digital-image analysis of the acetabulum in human fetuses.

The acetabulum is a clinical anatomical feature in the pelvis that is related to many congenital and acute pathologies afflicting the populace, especially the elderly. The developmental trends of the acetabulum are important to orthopedics and physical therapists in understanding the mannerisms and underlying factors causing their patient discomfort. At the Medical University of Silesia in Katowice Poland, a digital image analysis study was conducted on the acetabular fossa of 49 spontaneously aborted fetuses (49-left, 49-right and 23-male, 26-female) ranging in age from 20 –30 weeks to measure the development changes in depth, volume, and diameter. After statistical analysis (Statistica 6) a strong correlation ($p < 0.05$) was seen between age and depth, as well as between the volume and age of the fetus in use. Furthermore the diameter was seen to correlate significantly with age, but it did not correlate strongly with the side of the fetus in examination. Conclusively understanding the development of the acetabular fossa will aid in the diagnosis of many congenital deformities such as hip dysplasia.

HEYLINGS, David J.A. School of Medicine Health Policy and Practice. University of East Anglia, Norwich, Norfolk, UK. Reflections:- The undergraduate anatomy curriculum.

During the past 10 years the undergraduate medical curriculum within the United Kingdom has evolved at an alarming rate, driven by the General Medical Council. Over the same period there have been similar changes to the postgraduate surgical training. The typical 5 year undergraduate course should now be systems lead, have a clearly defined core. Approximately 30% of the curricular time should be free for the students to study in greater depth any area of interest. The fondly remembered comprehensive anatomical courses are just

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a memory for most undergraduates. Anatomy teaching time has been considerably reduced, forcing staff to ask “what must be covered and what can be left out”. A substantial number of the core curricula do not require student dissection yet they have great interest in optional anatomy units that allow students to dissect the cadaver. Nationally medical students, post graduate surgical trainees and examiners, have expressed concern over the reduction in anatomy. Based on the authors experience in a traditional curriculum and a new problem based curriculum, this paper will reflect on the issues anatomists have to face today in defining the undergraduate anatomical content working towards the wider “enlightened” educational goals.

HILBELINK, Don R., Department of Anatomy, University of South Florida, Tampa, FL. Development and delivery of a series of online undergraduate courses in Human Anatomy & Physiology.

Increased demand for undergraduate courses in Human Anatomy and Physiology prompted the development of a series of distance learning courses. The two courses in the series are delivered through a Blackboard portal, and each consists of five units composed of reading assignments, narrated power point presentations, practice quizzes, a five page research report, and a unit exam. All quizzes and exams are randomly generated from pools of questions and are computer delivered and graded. A two credit laboratory course is taken concurrent with the second course in the series. The online laboratory course is structured around the Interactive Human Anatomy Program developed by Primal Pictures. Enrollment in each of the three courses is currently capped at 250 students per term. The course enjoy a unique level of support from the University administration in that a significant portion of the tuition revenue generated by the courses has been committed directly back to the courses to support the technology necessary for online delivery of the courses, teaching assistant fellowships to assist in the implementation of the courses, and R & D support for the development and delivery of new distance learning courses in the basic medical sciences.

HILBELINK, Don R., Department of Anatomy, University of South Florida, Tampa, FL . Human spatial morphometrics.

Human spatial morphometrics is the quantitative analysis of human anatomical structure within a resolution independent, three dimensional, Cartesian coordinate system. Medical imaging technology now permits extensive, non-invasive visualization of the

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human body. Two dimensional medical imaging is quickly transitioning to volumetric (3D) imaging. Single modality (CT, MR, PET) imaging is quickly transitioning to multi-modality. Cellular and molecular imaging techniques are under developed. Alignment of these data sets into a defined common coordinate system will permit objective measurement and statistical analysis of a broad range of anatomical features. To demonstrate this concept, anatomical measurements were made using three volumetric anatomy data sets which included the Visible Human Male and Visible Human Female, as well as a clinical whole body scan. The three sets of volumetric data were loaded into the virtual human navigation visualization workstation, registered relative to a proposed human Cartesian coordinate system and measurements taken for a range of anatomical structures. Resulting data, as well as, representative methods for displaying and analyzing this data will be presented. This approach provide a framework in which to build a human spatial morphometric data base and maximize the possibilities to fully utilized computer technology in medical image analysis for 21st century medicine.

HILBELINK, Don R. Department of Anatomy, University of South Florida, Tampa, FL. Three dimensional Cartesian coordinate system for the human body.

Historically, human anatomy has been a descriptive science. Absence of a 3D coordinate system for the human body has significantly limited our ability to define limits of normal or alterations in anatomy that result from growth, aging or disease. To provide a framework for objective analysis, a three dimensional Cartesian coordinate system (three perpendicular, and intersecting planes) for the human body is proposed. Use of the three cardinal planes, in the universally recognized orientations, provides the most obvious approach. The cardinal planes proposed are: Sagittal: midsagittal plane, Transverse: upper-most extent of the iliac crests, and Coronal: anterior-most aspect of the vertebral canal. The point at which these planes intersect defines the 0,0,0 location in the human body. The proposed anatomical position for this system is a supine orientation with arms at the side of the body and hands pronated and resting on either side of the midsagittal plane, inferior to transverse cardinal plane. Use of a coordinate system permits anatomical features (size, length, location, angle, bounding boxes, etc) to be objectively measured. The ability to quantitatively describe the structure of the human body will significantly increase the value of medical imaging in 21st century clinical medicine.

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HILBELINK, Don R and Abhijit LOTHE*. Department of Anatomy, University of South Florida, Tampa, FL. Virtual Human Anatomy Navigation System.

The purpose of this project was to develop a computer-based system for real-time visualization of human anatomy for use in medical gross anatomy laboratory instruction. The system developed consists of a Dell 670 computer workstation optimally configured for image manipulation and display. To this system was added a 3D tracking sensor (pcBird, Ascension Technology). The full resolution image data for the Visible Human Male was loaded into the system. Software was developed to permit real-time visualization of planar images in any orientation through the volumetric data. A life-size mannequin was produced of the VH male. As the sensor device is pointed at the mannequin, a pie-shaped image is displayed similar in fashion to an ultrasound imaging system. Voxel classification data was added to the system to permit the user to identify a wide range of structures by clicking on any of the displayed images. The system is capable of delivering and grading a computer-based, gross anatomy laboratory practical examinations. The system will be incorporated into the laboratory component of an undergraduate Human Anatomy & Physiology course during the summer of 2005. Personal observation and student survey results will be summarized and presented. Supported by Innovative Teaching Grant, USF.

HILBELINK, Don. R., Karl MUFFLY*, Erin MORSE*, and Eric HOEGSTROM*. Department of Anatomy, University of South Florida, Tampa, FL. CAD and FE compatible virtual model of human-thin skin epidermis.

The goal of the project was to produce a virtual model of human epidermis for use in computer-based simulation studies. An exhaustive literature review was conducted to obtain information describing the size, shape, location, and three dimensional relationships of all cellular components found in human thin-skin epidermis. Using histological sections, published information was confirmed, and data not found in the literature but considered critical for accurate model development, was obtained. Three dimensional models of all relevant histological structures were drawn using animation software (3DMax). The virtual models were then imported and assembled into a volumetric model in a high-level computer aided design/finite element (CAD/FE) program (IDEAS, UGS Corporation). The compatibility of the model files with the CAD/FE software was confirmed and a simple thermal transfer study was run using the virtual model. For the past century the field of histology

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has focused primarily on two dimensional resource materials, leaving it to our minds eye to reconstruct the three dimensional relationships. New technologies, focusing on volumetric cellular and molecular imaging, will provide significantly more detail and place far greater demands on our understanding of the three dimensional organization of all human tissues. Supported by the NSF IGERT grant DGE 0221681.

HILBELINK, Don H., Britney R. THOMAS*, Sunil SAIGAL*, and Eric HOEGSTROM* University of South Florida, Department of Anatomy and Department of Civil Engineering, Tampa FL. Wavelet Analysis of Heart Geometry for Morphological Modeling.

The goal of the study was to define the geometry of the human heart for use in producing patient-specific, computed heart models for surgical simulation and finite element analysis. Wavelet analysis was conducted on a series of 2D images of planes through the hearts of the Visible Human Male and Female consistent with 2D ultrasound images obtained using current standard of care echocardiographic protocols. Image boundary data was collected and transformed using wavelet analysis. Using this data, new contours for the heart boundaries were calculated and used to compute a three dimensional heart model. This newly computed heart model was compared to a heart model previously produced directly from the full resolution Visible Human data. Several wavelet basis functions were fitted and compared and functional parameters were found to provide significantly greater detail of the overall anatomical structure than scalar parameters alone. This preliminary study provides confidence that wavelet analysis of a series of two dimensional medical images can provide sufficient heart geometry data for patient-specific heart modeling. The study is now being extended to evaluate a series of both 2D and 3D echocardiographic image data from a pediatric patient population undergoing evaluation for potential congenital heart malformations. Supported by NSF IGERT grant DGE 0221681.

HISLEY, Calvin, Larry ANDERSON*, Ronald WADE, Stephen KAVIC*, Paul NAGY* and Ivan GEORGE*. University of Maryland School of Medicine, Baltimore, MD., Departments of Radiology, Anatomy and Neurobiology, Surgery and the Maryland State Anatomy Board. Simultaneous physical and digital MR/CT 2D/3D dissection of a human cadaver combines classical, radiological and surgical anatomical instruction in a first-year honors anatomy course. We are testing the hypothesis that students experiencing both the

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digital and physical dissection methods will have a greater acumen to recognize structures from different viewpoints and their relationships to a specific surgical approach. Our approach allows students to dissect their cadavers both physically and digitally. The fresh and unembalmed male cadaver underwent whole-body MR and CT scans producing an archive of image sets for each body region. Subsequently, both image sets and the now-embalmed cadaver were made available for dissection. TerraRecon 2D/3D image analysis software was implemented on a server in Radiology. The 12 students were paired as collaborators and assigned specific body regions. In the laboratory, one student per pair physically dissected only, and the other used both the evolving dissection and the TeraRecon client on the workstation. This student generated planar and 3D models using each modality, demonstrating anatomical relationships in terms of an assigned surgical approach. Finally, each student pair presented their dissections and dynamic demonstrations of their 3D models using TerraRecon. Evaluation methods for each region tested students using faculty-generated 3D models and requiring them to recognize structures from six directions. Using both digital and physical methods improved the recognition of structures from different viewpoints

ISHIZUKA, Kyoko, Toshihiro HORIE*, Nobuyuki TSUZUKI*, Kazumasa FUJITA*, and Masabumi NAGASHIMA*. Department of Orthopedic Surgery, Chofu Touzan Hospital and Koshi Rehabilitation Hospital, Department of Anatomy, Saitama Medical School, JAPAN. Anatomical bases of entrapment neuropathy along the posterior rami of cervical and thoracic spinal nerves.

Peripheral nerve anesthesia is sometimes effective for patients with occipitalgia or back pain. Our hypothesis addresses whether spinal nerve entrapment between paravertebral muscles is pathogenic or not. The posterior rami of cervical and thoracic spinal nerves were dissected with total 20 donated cadavers. Detailed anatomy of the greater occipital nerve in the upper cervical level and the medial/lateral cutaneous branches in the entire thoracic region were investigated by stereomicroscopic dissection. At the cervical, the greater occipital nerve passes nearby the obliquus capitis inferior and penetrates the semispinalis capitis and trapezius. Dynamic study revealed that nerve entrapment by surrounding muscles was maximized in the extension posture. In the thoracic region, the medial cutaneous branches pass through the thoracolumbar fascia, rhomboideus, and trapezius. The lateral cutaneous branches pass between the longissimus and iliocostalis muscles. Subsequently they

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penetrate the thoracolumbar fascia and trapezius or latissimus dorsi muscle. In addition, the articular branch entering the zygapophysial joint was originated from the descending branch, which was the first arbor of the posterior ramus. We conclude that entrapment at the passing point of cutaneous branches might be pathogenic for painful neuropathy. Embryological categorization of the back muscles related to the posterior rami will be further discussed.

JACOBSON^{1*}, Nathan A., A. Jay FREEMAN^{1*}, Marios LOUKAS^{1,2}, ad Quentin A. FOGG^{1,3}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.; ³Department of Anatomy and Histology, Flinders University, Adelaide, AUSTRALIA. The true popliteal attachments of posterior leg muscles may have a significant influence on knee function and its surgical repair.

The popliteal fossa provides an attachment site for some muscles from the posterior aspect of the leg. This study attempts to clarify the attachment of the medial (MG) and lateral (LG) heads of the gastrocnemius muscle, and the plantaris (PL) muscle. Cadaveric knees (n = 20) were dissected to clearly identify the borders of attachment. The area of each attachment was measured digitally using Image J. In addition, the proximal-distal length between the most distal point of attachment and the tibial plateau was measured. The results suggest areas of attachment much greater and more varied than previously suspected (LG = $394.7 \pm 259.2 \text{mm}^2$; MG = $620.6 \pm 271.7 \text{mm}^2$; PL = $504.3 \pm 286.8 \text{mm}^2$). Variations included combination of the lateral head of the gastrocnemius and the plantaris muscles (n = 2; 10 %), and complete absence of the plantaris muscle (n = 1; 5%) Each muscle attachment was also extended more distally than previously thought (LG = $23.3 \pm 5.7 \text{mm}$; MG = $13.8 \pm 6.5 \text{mm}$; PL = $20.89 \pm 9.9 \text{mm}$). The larger and more distal attachments observed suggest greater optimal ranges of function for each of these muscles. Non-quantitative observations also suggest greater interaction with the posterior ligaments of the knee. Surgically, these muscles may be utilised to reinforce the ligamentous support of an unstable knee, or conversely, may complicate postoperative rehabilitation by unexpectedly tensing the posterior knee supports.

JONES, Gareth G., and Matthew, J. WELCK. Guy's King's and St Thomas's School of Biomedical Sciences, King's College, London, UK. A review of injuries to the external branch of the superior laryngeal nerve (EBSLN) during thyroid surgery.

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Damage to the external branch of the superior laryngeal nerve (EBSLN) at thyroidectomy has received little attention, possibly because damage results only in the loss of sustained high-pitched phonation - a problem largely for singers and/or public speakers. We performed detailed dissections of the EBSLN in ten cadavers to define its anatomical relationships. We reviewed four publications regarding the relative proportion of nerve types, using Cernea *et al's*1 classification, and sixteen papers relating to the rate of injury to the EBSLN during thyroid operations. Special attention was paid to the following variables: type of operation, method of intra-operative nerve identification, and identification of post-operative nerve damage. The actual rate of nerve injury during thyroid surgery ranges from 0-28%. (anatomically, 44.5% of nerves are at high risk of damage during ligation of the superior thyroid vessels). However, arguably, many studies were methodologically flawed, so that the true incidence may be higher. Five studies in which the surgeon actively searched for the nerve (with or without a nerve stimulator), resulted in an injury rate of 0%. Further research employing accurate nerve injury detection techniques, and a larger sample population, may help to define optimum operative procedures. ¹ Cernea C. R. *et al*/Surgical Anatomy of the External Branch of the Superior Laryngeal Nerve. *Head & Neck* 1992; 14: 380-383.

JUDSON, John P, Vishnadevi NADARAJAH*, Yi C. BONG*, Kalavathy SUBRAMANIAM*, Nalliah SIVALINGAM* and J RAVINDRAN*. International Medical University, Kuala Lumpur, MALAYSIA. Placental AT1 & AT2 receptors in pre-eclamptic placentae ñ An immunohistochemical study.

Pre-eclampsia affects 6-8% of all pregnancies. The aetiology is not fully known, but it is believed that placental mechanisms might have an important role to play. The objective of this study was to investigate the possible role of placental angiotensin II receptor subtypes AT1 & AT2 in the causation of pre-eclampsia. Hypothesis: A balance normally exists between placental AT1 and AT2 receptors during pregnancy, the disruption of which could result in altered blood flow in the placenta, leading to pre-eclampsia. Placentae from pre-eclamptic patients (n=11) and normal patients (n=11) were collected. Immunohistochemical techniques were used to determine the relative distribution and density of AT1 and AT2 receptors. Summary of results: It was observed that in normal patients, the

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level of AT2 receptors was higher than the level of AT1 receptors. However, in the patients with pre-eclampsia, the normal balance was altered and the level of AT1 receptors was observed to be significantly higher than that of AT2 receptors. Conclusion: The results indicate a definite imbalance of angiotensin receptors in pre-eclamptic placentae (higher levels of AT1 compared to AT2). This might cause increased vasoconstriction (thereby causing decreased placental blood flow and poor perfusion) leading on to placental ischemia and eventually, pre-eclampsia. (Sponsored by Grant No: BMS 0103/02 of the International Medical University, Kuala Lumpur, Malaysia.)

KAGAN, Ilya I., and Victor V. LEBEDYANTZEV*. Department of Operative Surgery and Clinical Anatomy, Orenburg Medical Academy, Orenburg, RUSSIA. Anatomical basis of the stylohyoid syndrome.

This study examines variations in the styloid process of temporal bone and their significance in the development of stylohyoid syndrome (Igle's syndrome), a painful condition caused by pressure on surrounding structures. We dissected 100 cadavers and examined orthopantograms of 75 patients with stylohyoid syndrome and 250 control subjects. The styloid process showed considerable differences in length (7 - 70 mm), thickness (2 - 6 mm), and in the angle of medial-posterior deviation (8° - 36°). Styloid processes in women were shorter, thinner, and with a greater angle of deviation than in men. The styloid process is situated near the glossopharyngeal nerve, the internal carotid artery and its plexus and the lateral wall of the pharynx. A long, deviated or distorted styloid process can press on these structures. On the affected side of patients with stylohyoid syndrome, 76.0% of processes were defined as distorted, 32.0% as long, and 41.3% as having maximal (30-36°) angle deviation. In the controls the values were 41.7%, 9.1% and 11.2% respectively.

KENIN S., V. BELKIN, Y. BENGAL, J. SOLOMON, and B. ARENSBURG. A morphological study of the internal thoracic artery in cadavers.

The proximity of the internal mammary or internal thoracic artery (ITA) to costochondral joints creates, morphological changes on the vessel due to osteoarthritis, osteophytic growth and hypertrophy that occurs in this joint during ageing. This ageing process is especially marked between the first rib, its cartilage and the sternum (Barchelon et al, 1996). And as a result the ITA that surrounds the ossified

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cartilage instead of being straight become, in this area, tortuous. The present study evaluates the anatomical, histological and morphological changes of the ITA in 10 cadavers. The cadavers were dissected and photographed. Curvatures of the ITA were observed especially in its proximal end, posterior to the first costochondral joint. The curved section of the ITA was examined for morphological changes in its inner wall. The results suggested no evidence of sclerotic plaques or intimal thickening in the artery despite the considerable changes that occurs in its course. This finding may support the relative immunity of the ITA to atherosclerotic obstructions.

KIK, Peter K, Nalinie WICKRAMASINGHE*, Nagaraj NAGATHAHALLI*, John MENSAH*, Simone BECKER*, Sabine WAIGEL*, and Wolfgang ZACHARIAS*. University of Louisville School of Dentistry. University of Louisville, Louisville, KY. Inhibitory RNAs to study cathepsin B functions in oral carcinoma cells.

Oral cancer is one of the 10 most frequent cancers worldwide, with an estimated 30,000 new cases being diagnosed in the U.S. every year. We have hypothesized that oral carcinomas with different local invasive properties and metastatic potentials possess distinct qualitative and quantitative differences in their expression patterns of cathepsins B, D, and L, and that the inhibition of such cathepsins with small inhibitory RNAs will diminish, or abolish, the malignant properties of these oral carcinoma cells. A unique pair of cell lines from either a primary tumor (1386Tu) or from a distant metastatic region (1386Ln) of the same patient have been used for this project. These cell lines were transformed with ribozymes targeted to the human cathepsin B mRNA. Cells were grown to approximately 80-90% confluence, and then harvested for Western blot analysis and real-time PCR. Protein levels were determined using Western blot. mRNA expression levels were monitored by real-time PCR. Cathepsin B mRNA expression was decreased as a result of transfection with ribozyme 681. Ribozyme 457 showed no statistically significant effect on cathepsin B mRNA levels in 1386Ln cells. Both ribozyme 457 and 681 demonstrated an inhibitory effect on intracellular cathepsin B protein. Extracellular cathepsin B protein was decreased as a result of transformation with ribozyme 457 in both cells, while extracellular levels of cathepsin B in 1386Ln were slightly increased in the presence of ribozyme 681. Both intracellular and extracellular protease activity of cathepsin B in both cell lines were reduced in the presence of ribozymes. Surprisingly, both ribozymes had quite different efficiencies in the primary tumor versus

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the metastatic cell line, an observation which needs further and more detailed examination. (Supported by NIDCR DE13150 and Philip Morris, Inc.)

KUMAR Manoj, Paramesh PUTTASIDDIAH*, Natarajan RAMALINGAM*, Heikki B WHITTET, Singleton Hospital, Swansea, UK. Variation in the size of lingual tonsil in 400 consecutive endoscopies.

The lingual tonsil forms part of the oropharyngeal ring of lymphoid tissue. It is however generally neglected as a cause of clinical symptom. The normal variation in the macroscopic appearance of this structure has not previously been documented. Variation in the macroscopic appearance of the lingual tonsil of 400 consecutive patients undergoing flexible endoscopy was documented. A grading system developed to categorize the size of lingual tonsil as follows. Grade 1: No visible hypertrophy of lingual tonsil. All anatomical landmarks are seen. Grade 2: Tongue base obscured by lymphoid tissue. Part of valleculae seen. Grade 3: Complete obscuration of valleculae and frenulum. Grade 4: Epiglottic obscuration, difficulty viewing the larynx. Forty-two percent of the lingual tonsils were of grade 2. Less than 2% were grade 4 and these patients had severe hypertrophy of the lingual tonsils leading to difficulty in viewing the larynx with a flexible endoscope. A lingual tonsillar hypertrophy grading system developed and the variation in the size of lingual tonsils in 400 patients described.

LIM* H. Jayne, Matthew D. GARDINER*, and Ian P. JOHNSON. Department of Anatomy and Developmental Biology, University College London. UK. A course-specific approach to developing a virtual learning environment in anatomy.

We previously reported that our medical students made little use of commercial anatomical electronic learning resources. Here we have developed an electronic learning resource after first surveying preclinical students to determine what they wanted. 167 out of 329 students replied. Using a scale of 1 (not useful) to 5 (extremely useful), in-house practice assessment questions with feedback were the most frequently requested online items (rated 5 by 84-90%) followed by lecture notes (rated 5 by 75%) and other course specific material. Guided by this, we used a commercial learning environment to present locally produced content alongside commercial learning resources. Preliminary data obtained after launch indicates that the tailor-made content is very popular when preparing for assessments (rated 4 or 5 by 87%). Students also

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stated that our resource had improved their access to electronic learning resources generally (rated 4 or 5 by 75%). With an ever-expanding curriculum, medical students have to employ a strategic approach to their learning. It is not surprising therefore that online content tailored towards local assessments is widely requested and used. This study indicates a need for commercial software that can be customised to integrate with individual courses.

LONGATO, Stefano, Christoph HARLANDER*, Diana LAZARESCU*, Werner LINDENTHALER*, Johannes PIEGGER*, and Claus POTOTSCHNIG*. Innsbruck Medical University, Division of Clinical and Functional Anatomy and Department of Otorhinolaryngology; MED-EL Austria, Innsbruck, AUSTRIA. Anatomical considerations on a trans-cartilaginous approach to the posterior cricoarytenoid muscle (PCAM) for electro-stimulation. Structural and functional damage of the recurrent laryngeal nerve (RLN) results in paresis of the PCAM. This causes impairment in phonation and respiration. Due to the topographic location of the RLN, lesions occur mostly during interventions on the thyroid gland. Beside surgical procedures on the vocal ligaments to improve phonation and respiration, posticus-electrostimulation-techniques can also be used. A ventral approach through the thyroid cartilage of the larynx offers a good possibility to reach the PCAM, because the cartilage is covered only by skin, and infrahyoidal muscles. In order to elucidate landmarks for the ideal pathway through the cartilage, we dissected 15 human laryngeal specimens. The obtained results have been applied in-situ on a specimen.

LONGATO, Stefano, Franz KRALINGER*, Helga FRITSCH*, and Felix AIGNER. Innsbruck Medical University, Department of Anatomy, Histology and Embryology, Department of Traumatology and Department of General and Transplant Surgery, Innsbruck, AUSTRIA.

Anatomical considerations on the "bare spot" of the glenoid cavity. The "bare spot" of the glenoid cavity has recently been described as a constant reference point to quantify the amount of bone loss of the inferior portion of the glenoid cavity. In shoulder surgery this spot should help the surgeon determining the width of the inferior portion of the glenoid cavity arthroscopically. The aim of this study was to determine the localisation of the bare spot within the glenoid cavity and to prove its usefulness in shoulder surgery by means of a macroscopic study using embalmed glenohumeral joints (N=20; 12 left, 8 right). Each glenoid cavity was photographed and transferred

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to a customary AutoCAD software programme. The bare spot was marked and the mean distances between the center of the bare spot and the inferior (a), anterior (b1) and posterior (b2) inner margins of the glenoid labrum as well as its relationship (c) to the mid-point of a virtual circle formed by the inferior portion of the glenoid cavity were measured (mean values for: a=9.70, b1=10.88, b2=13.71, c=3.2 mm). In most cases, the bare spot showed a significantly excentric position within the inferior part of the glenoid cavity ($p<0.05$). Due to the great variability of the shape of the glenoid cavity, an inferior circle according to previous descriptions could be only observed in half of the specimens. Following the results of our study the bare spot seems to be an insecure landmark for the determination of the center of the inferior portion of the glenoid cavity, although it has a constant appearance and is probably expressed as the effect of cartilaginous distribution due to dynamic shoulder activity.

LONGATO, Stefano, Josef OSWALD*, Christian SCHWENTNER*, Andreas LUNACEK*, Christian RADMAYR*, Helga FRITSCH*. Innsbruck Medical University, Division of clinical and functional Anatomy and Department of pediatric Urology, Innsbruck, AUSTRIA. Loss of interstitial cells of cajal and gap junction protein Connexin 43 at the ureterovesical junction in children with vesicoureteral reflux.

Symmetric muscular contractions and unidirectional peristalsis are prerequisites for a competent valve function at the ureterovesical junction (UVJ). Interstitial cells of Cajal (ICC)s are pacemaker cells that create and coordinate peristaltic motility. Ureteral endings were immunohistochemically investigated to elucidate the presence of c-kit positive ICCs as well as the occurrence of gap junction protein connexin 43 (Cx43) in children with vesicoureteral reflux (VUR) to identify a possible pathogenetic factor of an insufficient anti-reflux mechanism. Distal ureteral specimens were obtained from 27 children undergoing anti-reflux surgery. Routine histological paraffin embedded sections were immunostained detecting the c-kit protooncogene to study the presence of ICCs as well as Cx43 positive cells to determine the gap junction density within the ureteral wall. Age matched nonrefluxing ureteral endings served as controls. All investigations were done on the basis of high power field magnification for semiquantitative analysis and statistically analyzed. ICCs were present in both refluxing and nonrefluxing ureteral endings. Healthy individuals displayed significantly more ICCs than children with VUR. Connexin 43 immunoreactivity was significantly reduced in all refluxing ureteral specimens, whereas it was homogeneously distributed in normal controls. Refluxing ureteral endings significantly lack these pacemaker cells implying a

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malfunctioning valve mechanism permitting VUR. A substantial reduction of gap junctions in this region adversely affects intercellular signalling aggravating coordinated peristalsis which is essential for a competent anti-reflux mechanism.

LOUGHENBURY, Peter R.* , Sharan WADHWANI* , and Roger W. SOAMES† . School of Biomedical Sciences, University of Leeds, UK and †School of Veterinary and Biomedical Sciences, James Cook University, Queensland, AUSTRALIA. Unusual variant of the spinal dural sheath: a case report.

A variation in the anatomy of the spinal dural sheath was observed during routine cadaveric dissection, which consisted of complete almost identical dural layers strongly adherent throughout their length. The double dural sheath completely enveloped the spinal cord and nerve roots, and extended from C₂ to L₅. Both layers were of similar thickness to a single dural sheath. As far as can be ascertained, duplication of the dura mater in the form of two complete dural sheaths has not been previously observed and/or reported in a cadaveric study. However, areas of localised duplication of the dural sheath on its ventral aspect have been observed during intra-operative dissection, particularly in association with idiopathic herniation of the spinal cord. The present report describes a complete duplication of the dura mater, a previously undocumented variation, which is of clinical interest in the area of spinal surgery, with particular relevance to idiopathic spinal cord herniation.

LOUIS, Robert G. Jr.^{1*} , John FITZSIMMONS³ , Gene COLBORN¹ , and Marios LOUKAS^{1,2} . ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. ³Michigan State University Department of Radiology, MI. Re-defining the surgical anatomy of the medial and lateral pectoral nerve for use in neurotization procedures.

The use of pectoral nerves in neurotization procedures is well outlined in the literature, yet the specific anatomy remains obscure and often incorrect, both in the literature and in standard anatomical texts. Data regarding the exact number of pectoral nerves, their points of origin and branches, and the location of the ansa pectoralis with respect to the arterial system, is of particular relevance with regards to surgical procedures. The aim of our study, therefore, is to contribute to the advancement of valuable anatomical knowledge in order to facilitate intra-operative access to and utilization of pectoral nerves in neurotization procedures. One hundred forty (280 brachial

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plexuses) formalin fixed cadavers were examined during the period of 2000-2005. In all specimens, pectoral nerves originated separately from the anterior divisions of superior, middle, and inferior trunks of the plexus with frequencies of 1.22, 3.12 and 1.00 respectively. The lateral pectoral nerve divided into a superficial and a deep branch: The superficial branch supplies the clavicular head of the pectoralis major muscle, while the deep branch supplies the medial portion of the clavicular head and superior portion of the sternal head of pectoralis major. Additionally, the deep branch of the lateral pectoral nerve forms the ansa pectoralis with the medial pectoral nerve. The thoracoacromial artery originated directly from the axillary in 100% of specimens whereas lateral thoracic artery did so in only 17.1% of the specimens. The ansa pectoralis, which was always present, was located distal to the thoracoacromial artery in 100% of cases and distal to the lateral thoracic artery in 82.2% of the specimens. Detailed anatomical knowledge of the pectoral nerves is of clinical importance both for their use during reinnervation surgeries and to allow easy intra-operative access, if they are to be spared, in other surgical procedures such as mastectomy, orthopedics or those related to trauma.

LOUKAS, Marios^{1,2}, and Robert G. LOUIS Jr. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. A newly discovered endoscopic surgical procedure for the release of the pudendal nerve. Pudendal canal syndrome (PCS) is induced by the compression or the stretching of the pudendal nerve within Alcock's canal. The complete syndrome presents with anal incontinence, pain, hypo or hyperesthesia and urinary incontinence (and impotence in males). There are two favored surgical procedures. One involves a trans-perineal approach that consists of opening Alcock's canal to give the pudendal nerve sufficient space to alleviate stretching or compression. The second consists of a trans-gluteal approach, which involves placement of a clamp between the sacro-spinal and the sacro-tuberous ligaments to facilitate relief by cutting one, or both of them. Considering the difficulty and possible complications involved in exposing the pudendal canal and nerve by either trans-perineal or trans-gluteal approach, laparoscopic pudendal canal decompression (PCD) was employed. Thirty formalin fixed cadavers were examined. For laparoscopic PCD a pneumoperitoneum was established. 5/10mm trocars were placed in the umbilicus and a zero degree laparoscope was introduced. Three additional trocars were placed in suprapubic, umbilical and left-lower quadrants. Under

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the guidance of a laparoscope, the peritoneum was cut laterally to the bladder and the arcus tendineus levator ani and fascia pelvis were identified. The latter was split open and the pubococcygeus and iliococcygeus were divided, allowing the pudendal canal to be clearly visualized and subsequently, the PCD performed. Considering that none of the surgical procedures currently used, are known to completely improve all the symptoms of PCS, this operation could theoretically reduce stretching of the pudendal nerves by facilitating reduction of levator plate sagging by levatorplasty. In conclusion, laparoscopic PCD is a relatively simple and safe procedure. It allows for better exposure of the contents of the ischioanal and ischioanal fossae and the levator ani muscle than any of the open procedures.

MACCHI Veronica*, Andrea PORZIONATO*, Dan SMITH*, Giacomo NOVARA*, Mario GARDI*, Walter ARTIBANI * and Raffaele DE CARO. Department of Human Anatomy and Physiology, University of Padova, and Department of Oncological and Surgical Sciences, University of Padova, ITALY. Anatomical Basis of surgical treatment of female stress urinary incontinence.

Tension-free vaginal tapes (TVT) and tension-free urethral suspension (TVT-O) are surgical techniques for female stress urinary incontinence, having long-term efficacy. The aim of the present study was to evaluate the anatomical relationship between the device and the neighboring structures. Dissections have been performed in 10 unembalmed female cadavers, white Caucasian, no age selection, with intact lower pelvis and the following parameters were evaluated and recorded: the length of the distance of the pathway between the right endopelvic fascia to the left endopelvic fascia passing below the mid urethra; the length of the distance of the pathway between the right obturator membrane to the left obturator membrane passing below the mid urethra. A string/tape has been passed as during a standard TVT or a TVTO and stabilised with no tension below the mid urethra. After careful anatomical dissection, the string is cut bilaterally or at the level of endopelvic fascia or at the level of obturator membrane. The strings are then retrieved and measured in mm. The anatomical parameters are useful indication for surgical purpose.

MACCHI Veronica*, Andrea PORZIONATO*, Cristian STEFAN¹, Anna PARENTI*, and Raffaele DE CARO. Department of Human Anatomy and Physiology, University of Padova, and Department of Oncological and Surgical Sciences, University of Padova, ITALY.

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¹Department of Cell Biology, University of Massachusetts Medical School Worcester, MA. Clinical neuroanatomy and students' learning.

The "Short course of Dissection" is a course proposed to the medical students, and offers a direct experience of gross anatomy. To evaluate the effectiveness of dissection in knowledge of anatomy in the short-term and long-term (after 1 year), an anatomoclinical questionnaire has been administered at the beginning and at the end of the meeting and consists in 3 diagrams, showing the brain base, the convexity of the cerebral hemispheres, and an intermediate plane at the level of the Flechsig section. The students were asked to point anatomical landmarks at the 1st (anatomical) questionnaire and to recognize the same nervous structures, presented in their clinical relevance, in the 2nd (anatomy-clinical) questionnaire. The 2nd questionnaire showed an improvement of knowledge in neuroanatomy in 57%, especially in diagram-C (72%), with respect to diagrams-A (43%) and B (40%). The long-term assessment showed that the group, that attended to the course, correctly answered in 65% with respect to a control group (40%). The main guidelines in planning the meeting have been: 1. the selection of the anatomical landmarks relevant from the clinical point of view; 2. the selection of the pathologies useful to the detection of selected anatomical landmarks; 3. the anatomy-clinical correlation between normal morphology and pathology.

MacPHERSON, Brian R., Anatomy and Neurobiology, University of Kentucky College of Medicine, Lexington, KY. The Student Liaison Group – enhancing the Quality Assessment Report within a developing Curricular Quality Assurance Plan.

The Office of Medical Education at the University of Kentucky College of Medicine (COM) recently adopted a new Curricular Quality Assurance Plan (CQAP) as a means of ensuring the quality of our end product – competent lifetime learners. This plan was designed to identify curricular areas where problems existed - as defined annually either by course faculty and/or student evaluations - and correct them, or at least indicate steps that will be taken to correct them, as soon as possible. To date, all first and second year courses are on board and as such are required to submit annual Quality Assessment Reports (QAR) within ninety days of the end of the course. All QARs are reviewed by the Curriculum Committee and the Senior Associate Dean for Medical Education issues a "snapshot" of the curriculum annually. The QAR incorporates the statistical analysis of the course as reported by the students through

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the annual COM-administered course evaluation. One of the problems of basing a portion of the QAR on student evaluations is that we are continually working behind the curve and the students are never aware if any of their changes were/have been incorporated – and often they are not. To remedy this, we initiated a Student Liaison Group (SLG) in the medical histology course. The SLG consisted of eight volunteers from the class of 103, who agreed to listen to student concerns and take them to meetings with the course faculty throughout the thirteen week block. The group met twice during the block - once after the midterm exam and again just before the final exam. This allowed us to make changes, suggested by the students, to the course while it was in progress, or explain to the group why the suggestion could not be incorporated. The SLG brought a wide variety of concerns to the meetings, and about 1/3 of these were acted on during the block. The value of the group, and its proposed function was highly rated on the student evaluation (3.8 out of 4.0). Among the final suggestions this past year was to have the SLG meet more often, especially in advance of the midterm exam. The course faculty feel this interaction with the class helps fully explain why numerous ideas we see annually on the course evaluation cannot be rationally incorporated, and the reasoning brought back to the class in advanced of this year's evaluation.

MAHAJAN*, Mehandi V., Uday B. BHAT*, Suhas V. ABHAYANKAR* and Medha V AMBIYE*. Department of Anatomy and Department of Plastic Surgery, Topiwala National Medical College, Mumbai, INDIA. Anthropometry of the eye-nose-lip complex in the young adult Indian population. (sponsored by B. R. MacPherson).

Anthropometry means knowing the dimensions of human body. To restore normalcy out of abnormality; one must identify what is normal. Though anthropometric data on facial features of other races are available, there is no comprehensive study of relevant facial parameters of Indians. The eye - nose - lip Complex being the most prominent part of the face catches the observer's attention first and hence is chosen as an area of special interest. The objectives of the study were: 1. To obtain relevant Indian data on facial anthropometry; 2. To study the relation between Indian males and females; and 3. To compare the Indian data with other world races. One hundred and sixty-nine volunteers (72 males; 97 females; Age:- 18 to 30 yrs) were tested. 18 parameters were studied, with the help of direct measurements on living subjects. The inclinations and the profiles were determined using photographs. Statistical analysis revealed certain interesting facts. The Indian male faces presented significant-

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ly higher values than the females with the exception of palpebral fissure height, which was vice-versa. On comparison with the other world races, the Indian parameters did not conform to any of the 3 major races: - Orientals, Negroid and Caucasians. We conclude that quantitative analysis of data has made it possible to define a typical young Indian adult face. Differences between Indian male and female parameters and comparison with the other world races were statistically studied. Thus this study is a genuine effort to establish certain values of Indian face with the help of anthropometry, which indeed would benefit the plastic and reconstructive surgeons, forensic scientists, criminologists and the artists.

MARTINO, Leon J., Nancy A. WILSON-MARTINO*, and Charles H. KITE*. Division of Medical Education, Albany Medical College, Albany, NY. Enhancing peer taught dissection rotations: Introduction of the laboratory quiz.

In response to increasing time constraints in the first year curriculum, various forms of rotational dissection with peer teaching in anatomy have been employed. In our format, teams of 6 students are assigned to a cadaver. On a rotational basis, two students from each team perform a given dissection and prepare a 45 minute teaching and prosection demonstration of their dissected cadaver to be presented to their remaining team members. While reasonable on the surface, this approach posed several problems. There were concerns of preparedness of teaching, quality of dissection, and notwithstanding, the attentiveness and receptiveness of the rotational team members to be peer taught. Students tended to become disenchanted with their peer taught dissection, and lose interest in organized laboratory sessions. In an effort to address these issues, we have instituted an "at the table" laboratory quiz for each peer taught dissection demonstration session. Following the presentation, the two students who taught the demonstration leave the laboratory, while the remaining four students complete the quiz. The quiz is a team event, with one exam per table. Students are encouraged to discuss the questions within their respective teams, utilize the dissected cadaver as a reference, collectively decide on the answers, and submit the quiz as a team. The result is a team score, of which all six students, the four actually taking the quiz, and the two who peer taught, receive the same grade. Quiz scores are then incorporated into the individual student final grade. While we do not yet have data to access improvements in overall anatomy performance, it is evident that the introduction of the team quizzes has increased the quality and attentiveness of team dissection

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sessions. Knowing that their score depended upon their ability to peer teach their team, maximum effort was put into laboratory presentations, often with diagrams and handouts as teaching resources prepared by the peer teachers. With the realization that the cadaver could be used as an open book for the quiz, the quality of the dissection improved. There was greater attentiveness and participation of the entire team during the teaching and demonstration sessions. Students came to the demonstrations better prepared to be taught, actually studying the material before hand. Student-student interactions at the prosection demonstrations notably increased. During the taking of the quiz, further discussion of the anatomy was prevalent, with students having to convince the members of their team that an answer was correct. In addition to improving the attitude about and teaching of anatomy, this has created a formal experience in which teamwork and collegial collaboration are emphasized and rewarded. Responsiveness by the students was extremely positive. Pride in team dissection and effort increased and competitions between individual teams as to performance was evident.

MATUSZ, Petru L. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. Intraparenchymal morphology of vascular elements in the dorso-petal liver. Study on corrosion casts.

The dorso-petal (DP) liver has a more bulky left lobe, presenting a reduced anteversion or even retroversion; the contact between liver and diaphragm is made on a reduced surface. Out of 155 hepatic corrosion casts, 42 (27.10%) presented a DP aspect. On these, we analyzed the morphological types (MT) of the lateral branches (LBr) of portal hepatic vein (PHV), of the middle and left hepatic vein (MHV, respectively LHV). Casts were made by injecting with plastic the vasculo-ductal elements, followed by corrosion of the parenchyma with hydrochloric acid. We found: TI of superior LBr of the PHV in 71.43% cases, with only one thread-like branch, and TII with two thread-like branches in 28.57%. Most of the inferior LBr of the PHV (95.24%) had a short trunk with multiple branches in bouquet. We found 3 MT of the MHV, but mostly TIII with the predominance of the left anterior vein (69.05%). The LHV has frequently a short trunk with late merging of origin tributaries (TII 90.48%). This study shows the strong correlation between the several MT of the LBr of the PHV, MHV and LHV and the apparition of the DP liver.

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MATUSZ, Petru L., Delia Elena ZAHOI*, Agneta Maria PUSZTAI*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. Intraparenchymal morphology of vascular elements in the ventro-petal liver. Study on corrosion casts. The ventro-petal (VP) type of liver has the left hepatic lobe of smaller sizes, presenting a greater anteversion, and the contact between the liver and the diaphragm is realized on an extended surface. Out of 155 hepatic corrosion casts, 113 casts (72.90%) presented a VP aspect. On these casts we analyzed the morphological types (MT) of the lateral branches (LBr) of the portal hepatic vein (PHV) and of the middle and left hepatic vein (MHV, respectively LHV). Casts were made by injecting with plastic of the vasculo-ductal hepatic elements, followed by corrosion of the parenchyma with hydrochloric acid. We found: TI of superior LBr of the PHV in 100% cases, with only one thread-like branch, and a great dispersion of the inferior LBr (4MT), most often TII (46.90%), with a short trunk having multiple branches in bouquet. We found that most often the MHV has the two-origin tributaries equal in dimensions (TI 83.19%), and LHV with a long, individualized trunk, with early merging of the origin tributaries (TI 96.46%). This study shows the strong correlation between the several MT of the LBr of the PHV, respectively of the MHV and LHV and the apparition of the VP type of liver.

McINTYRE*, Aimee, Olivia DUNCAN*, and Stuart W. McDONALD, Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK. The suprascapular nerve and its branches.

A small number of original papers have described the anatomy of the suprascapular nerve, but few show photographs of dissections. This demonstration aims to illustrate the anatomy. We dissected the suprascapular nerve in 6 cadavers (12 shoulders) and used a Nikon Cool Pix 990 digital camera to photograph the results. The features illustrated are: 1) the suprascapular nerve arising from the superior trunk of the brachial plexus, 2) the suprascapular nerve passing under the superior transverse scapular ligament, 3) branches to supraspinatus, 4) branches to infraspinatus, 5) the branch to infraspinatus passing through the spinoglenoid notch, 6) the branch to infraspinatus passing under the spinoglenoid ligament, 7) the branch to infraspinatus being distributed to the muscle, 8) branch to the periosteum of the coracoid process. Sensory branches are also described to the shoulder and acromioclavicular joints and, occasionally, to the skin, but these were not observed in our specimens.

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McKECHNIE* Laura A., Paul J. McNAMARA*, and Stuart W. McDONALD. Laboratory of Anatomy, University of Glasgow, Glasgow, Scotland, UK. Defining the palmar arterial branches.

At dissection it is difficult to identify the branches of the superficial and deep palmar arches: common palmar digital, radialis indicis, princeps pollicis, palmar metacarpal and ulnar digiti quinti arteries. The problem of identification arose because of variations in the arches and the origins of the branches. We dissected both hands of 5 cadavers (4 female, 1 male; aged 72 - 94 years old). Common palmar digital arteries arose from the superficial arch, varying in number from 1 to 4. They gave rise to the proper digital arteries. Palmar metacarpal arteries arose from the deep arch and terminated in the metacarpophalangeal joints or anastomosed with the common palmar digital arteries. If the superficial palmar arch was complete, the radialis indicis arose from the first common digital artery. If the arch was incomplete, the radialis indicis arose from the deep arch and the thumb was supplied by the dorsal metacarpal artery from the deep branch of the radial artery. The ulnar digiti quinti artery was variable in origin. We hope our insights are helpful to others.

McLEOD* Chloe and Stuart W. McDONALD. Laboratory of Human Anatomy, University of Glasgow, Glasgow, Scotland, UK. Insights from a historical review of the maxillary nerve.

Accurate knowledge of the maxillary nerve is important for facial surgery and dentistry. A historical review of the maxillary nerve provided insight to a number of details of its anatomy which do not receive the attention in modern textbooks that they once did. Features of the maxillary nerve were described by Galen and Vesalius. The pterygopalatine ganglion was described by Meckel in 1748. He seems to be the authority for the two ganglionic branches connecting the maxillary nerve to the ganglion frequently illustrated in textbooks. Over the last 200 years, controversies about the maxillary nerve and its branches have included: 1. connections of the maxillary nerve and other intracranial parts of the trigeminal nerve. 2. the shape of the pterygopalatine ganglion and its connections with the maxillary nerve. 3. the occurrence of a 'nasopalatine' ganglion. 4. the arrangement and distribution of the superior alveolar nerves. 5. the distribution of the palatine nerves. This demonstration reviews these controversies and highlights features described in the older literature, which might merit greater coverage in contemporary textbooks.

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McNAMARA* Paul J., Laura A. McKECHNIE*, and Stuart W. McDONALD. Laboratory of Anatomy, University of Glasgow, Glasgow, Scotland, UK. Arterial diameters of the branches of the superficial and deep palmar arches.

No previous studies relate the diameters of the branches of the superficial and deep palmar arches, although the arches are reported to be inversely proportional in calibre. We dissected both hands of 5 cadavers (4 female, 1 male; 72-94 years old). Complete superficial palmar arches occurred in 4/10 hands; incomplete in 5/10. In one hand the superficial arch was absent and the deep arch was incomplete. Although numbers are small, when the superficial palmar arch was complete, the common palmar digital arteries were significantly larger ($2.03 \text{ mm} \pm 0.54 \text{ mm}$) than the palmar metacarpal arteries ($1.17 \text{ mm} \pm 1.00 \text{ mm}$) of the deep palmar arch ($P < 0.05$). When the superficial palmar arch was incomplete or absent, the palmar metacarpal arteries were significantly larger ($1.55 \text{ mm} \pm 1.11 \text{ mm}$) than the common palmar digital arteries ($0.75 \text{ mm} \pm 1.13 \text{ mm}$) ($P < 0.05$). When the superficial palmar arch was incomplete, the diameter of the radial artery was significantly larger ($3.68 \text{ mm} \pm 0.29 \text{ mm}$) than that of the ulnar artery ($2.08 \text{ mm} \pm 0.72 \text{ mm}$).

MILLER, Brian T., and Thomas J. COLLINS*. Division of Anatomy, Department of Neuroscience and Cell Biology, University of Texas Medical Branch, Galveston, TX. Design and evaluation of an academic game in a clinical anatomy course.

The UTMB Gross Anatomy and Radiology course includes lectures, dissections, and small group sessions in which students explore anatomy by discussing clinical cases in a problem-based learning (PBL) format. Important elements of anatomy are reviewed before the entire class in weekly case wrap-up sessions. In an effort to make the wrap-up sessions more rigorous and interactive, we initiated an academic game at the end of each session. In this game, dubbed "Who's Anatomically Correct?" (WAC), eight student representatives from different PBL groups are selected to form two competing teams. The object of the game is to score points by correctly answering questions about the clinical case of the week and related elements of anatomy. Individual students must answer an initial question correctly before their entire team is allowed to answer a subsequent question. Based on course reviews and the results from a separate survey, our students were extremely enthusiastic about WAC. Over 96% of the survey respondents indicated that they played the game along with the contestants in order to test their knowledge of the topics. The consensus of both

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students and faculty was that WAC provided a valuable and engaging means of reviewing the anatomy covered during the week.

MIRKIN*, Sue, Marilyn J. DUXSON*, Helen D. NICHOLSON, and Ming ZHANG. Department of Anatomy and Structural Biology, University of Otago, NEW ZEALAND. The transverse humeral ligament and the soft tissues over the intertubercular sulcus of the humerus.

Medial dislocation of the long head of biceps tendon (LBT) may occur with an intact transverse humeral ligament (THL), which contradicts its traditional anatomical description as a retinaculum for the LBT. The aim of this study was to investigate the anatomical inter-relationship between the THL and those soft tissues over the intertubercular sulcus (ITS). We examined 34 cadaveric shoulders: 21 by dissection, 6 by E12 sheet plastination and 3 using histological examination. A single ligamentous structure was not found over the ITS. Instead, three layers of dense connective tissue overlaid the LBT. The deep layer consisted of the fibrous tissue of the synovial sheath blending with the periosteum of the ITS walls. The superficial layer was mainly composed of subscapularis tendon fibres which attached to the greater tuberosity. A longitudinal bundle was sandwiched in between the deep and superficial layers, forming a middle layer. This middle layer was a very small bundle of the tendon of the pectoralis major and continued proximally with the fibrous capsule of the shoulder joint. These results challenge the existence of the so-called transverse humeral ligament and provide a new anatomical basis to further understand the mechanisms underlying LBT dislocation.

MIS*, Anna, Martyna POLAK*, Niket SONPAL*, Jerzy St. GIELECKI*[#], Anna ZURADA*, and Pawel RDES*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND .

[#]Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). The differences in reactions and feelings of English and Polish Divisions of medical students after direct contact with cadavers.

Many aspects of medical school can be intimidating, especially working with cadavers in gross anatomy courses. In the academic years 2003-2004 and 2004-2005, a survey was distributed to 363 MS1 and MS2 students to assess differences in their knowledge of "Body Donation Programs" between the English (ED) and Polish Divisions (PD) at the Medical University of Silesia in Katowice, Poland. The reactions were measured with a 14 question "multiple

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choice" survey. 228 MS1-PD students and 99 MS2-PD completed the survey while 30 MS1-ED completed the survey (response rate (>85%). The survey indicates that many differences and similarities exist between ED and PD. With regards to knowledge of how bodies are obtained the PD groups show greater interest than the ED (70%^{ED-MS1}, 91%^{PD-MS1}, 89%^{PD-MS2}), as well as show a greater interest in knowing the fate of the cadavers (73%^{ED-MS1}, 85%^{PD-MS1}, 88%^{PD-MS2}). However, the ED students tend to know more about what a body donation program consists of (96%^{ED-MS1}, 52%^{PD-MS1}, 28%^{PD-MS2}). Irregardless of previous knowledge, both groups show varying knowledge about the cadavers and thus imply a desire to be educated about body donation.

MORRISON¹, Stuart C., Sunny PITT^{1*}, and Richard L. DRAKE². Department of Radiology¹, Department of Surgery² Cleveland Clinic Lerner College of Medicine, Cleveland Clinic Foundation, Cleveland, OH. Superior vena caval thrombus with an unusual systemic to portal venous collateral pathway.

Superior Vena Cava [SVC] Syndrome was first described by William Hunter in 1757. The cause of this syndrome has changed over the centuries. Initially described as a syphilitic aneurysm of the ascending aorta compressing the adjacent SVC it is now more commonly identified secondary to bronchial carcinoma. Complications from long term indwelling intravascular catheters are now becoming an increasingly common cause of SVC syndrome. An adolescent with lymphocytic leukemia had a central line inserted successfully into the left subclavian vein for chemotherapy. Several months later he presented with swelling of the anterior chest wall and left axilla. Ultrasound showed a thrombus of the left subclavian vein. A CT scan showed that the thrombus extended into the left brachiocephalic vein and SVC. CT scan also showed an area of intense enhancement in the anterior medial segment of the left lobe of the liver. This "hot spot" has been described earlier on radionuclide liver scans and represents an unusual collateral pathway from the systemic circulation following SVC obstruction through the portal circulation to the Inferior Vena Cava. An understanding of the venous anatomy of the mediastinum and anterior abdominal wall will be used to explain this imaging observation.

MOQATTASH Satei, Hani SAMAWI*, Omar HABBAL*, Ibrahim INUWA*, Ravinder KENUE*, and Ziad BATAINEH*. Department of Anatomy, College of Medicine, and Department of Mathematics,

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College of Science, Sultan Qaboos University, Muscat, SULTANATE OF OMAN. A comparison of students' performance in multiple choice question vs. short answer question format in anatomy spotter exams.

In this study we compared students' performance in two types of anatomy spotter exams. The first contained short answer question type, (SAQT), and the second contained multiple-choice question type (MCQT). In all types of spotters, questions comprised identification of macroscopic and microscopic structures, and questions related to their development, blood supply and innervation. Normal and abnormal X-rays, MRI and CT scans were also included. Results of spotter exams from three courses were used in this study, the cardiovascular system (CVS) (371 students) and the respiratory system (RSPS) (368 students), third year students, and the head and neck (H&N) (429 students) fourth year students. Analysis of variance models (ANOVA) one-way and Factorial model were used in this comparison. For each system, a comparison of Students' performance in SAQT (701 students) vs. MCQT (467 students) was made. The total number of students used in this comparison was 1168. The main factors in this comparison were the question type and the course assessed. Our results indicate that in all courses assessed students performed better in the MCQT (Mean=85.01±8.37) than in the SAQT (Mean=80.58±10.56) regardless of the course assessed. On the other hand, Students performed best in the CVS (Mean=85.80±8.36) course and worst in the RSPS (Mean=76.13±10.25) course regardless of the question type used. Our results indicate that in anatomy spotter exams the question type is a significant factor in affecting students' performance. We conclude that the use of the MCQT in anatomy spotter exams may be a better tool in measuring student's knowledge than the SAQT since it may depend on the student's problem solving skills, and his ability to synthesize, communicate knowledge and make rational decisions. However, student's performance in the SAQT may be partially more dependent on the student's ability to memorize and recall anatomical terminologies, structures' names, and other linguistic hurdles.

NAGY^{1*}, Ryan, Robert G. LOUIS Jr. ^{1*}, and Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
Perirenal communications and spaces: a closer look.

The continuity of the perirenal space across the midline of the body has been a point of controversy in the anatomic, radiologic and

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surgical literature. The aim of our study therefore, was to dissect out the area between the two kidneys and prove the existence or lack thereof, of such a communication. We examined 45 formalin fixed cadavers during 2004-2005 years. In all the cadavers, we identified the perirenal spaces and the renal fascia was separated from peritoneum. The renal fascia was dissected on its medial side and appeared to be continuous across the midline in front of the aorta and IVC, posterior to the head of the pancreas and the distal end of the descending colon forming a communicating channel between the two perirenal spaces. In 60% of the specimens the renal fascia appeared as a firm, well defined and separable structure at the midline. In the remainder of the specimens, this fascia appeared to be ill defined and very difficult to dissect, however, still recognizable. The midline fascia was found to extend between the levels of L3-L5. The inferior midline border of the fascia blended over the adventitia of the great vessels, downward to the bifurcation of the aorta. In 60% of the specimens we were able to notice an inferior extension, which continued to the pelvis via ureters and iliac vessels. The superior border of this fascia extended to the posteromedial border of the diaphragm along the lateral margins of the psoas major muscle and the anterior margins of the quadratus lumborum. Our study could prove useful in order to explain how perinephric collections of fluid flow into the pelvis or across the midline.

NAIR, Narga. Department of Anatomy, Kasturba Medical College, Manipal, Manipal Academy of Higher Education, Karnataka, INDIA.
Evaluation of the thoracic anatomy module at Manipal.

Students in their first academic year in Medicine learn the preclinical science subjects of Anatomy, Physiology and Biochemistry over a twelve month period, at the end of which they are required to undertake a board certifying exam in the above mentioned subjects. The evaluation consists of a comprehensive exam in the theoretical, practical and viva voce formats. The teaching learning program in Anatomy consists of lectures, gross anatomy lab sessions and histology lab sessions. The above is carried out in a regionwise approach beginning with the study of the limbs, followed by thorax, head and neck, neuroanatomy and ending with abdomen. Embryology is incorporated where appropriate to the region studied. This study was carried out to evaluate the existing teaching-learning program in thoracic anatomy for first year medical students. The objective of this study was to assess the recall of basic facts and the understanding of basic concepts involved in human thoracic anatomy. 200 students having completed their thoracic anatomy

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module were tested at the same time, under the same conditions using a measuring instrument that consisted of completion type of short answer objective test items. The difficulty index and the discrimination index of each of the test items were computed. Of the ten test items, items 3 and 10 were unacceptably easy, possessing marginal discriminatory capacity and requiring modification of the items. Item 9 was unacceptably difficult. This test was easy to construct and administer and provided useful feedback, although the achievement of all instructional objectives could not be tested.

NORTON, Neil S., Margaret A. JERGENSON, and Laura C. BARRITT. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE. An anomalous inferior alveolar nerve formed by multiple contributions which surround the maxillary artery.

Inferior alveolar nerve (IAN) anesthesia is an important injection in dentistry. The IAN provides pulpal innervation to the mandibular teeth and facial gingiva from the premolars to the central incisors. In a standard IAN block, anesthetic is deposited into the pterygomandibular space enveloping the IAN, producing anesthesia. Practitioners find patients in which the IAN is difficult, or impossible, to anesthetize. We report an anomalous situation, occurring bilaterally, that was observed during routine dissection. In this cadaver, two branches exited the lateral pterygoid to form the IAN. Following removal of the muscle, the two branches forming the IAN were observed to closely surround the maxillary artery. Vascular anomalies in close proximity to a branch of the trigeminal nerve are a hypothesized cause of trigeminal neuralgia. In this case, pulsations of the maxillary on the branches forming the IAN could lead to paroxysmal pain. Additionally, the unique manner in which the IAN is formed could prevent anesthetic from properly enveloping the IAN thus leading to insufficient anesthesia.

Martina OKWUEZE, and Lillian B. NANNEY, Department of Plastic Surgery, Cell & Developmental Biology, Vanderbilt School of Medicine, Nashville, TN. Unexpected prevalence of motor axons in the distal superficial radial and posterior interosseous nerves: A cadaver study with immunohistochemical evidence.

Anatomical variations of peripheral nerves supplying the hand such as the Martin-Gruber and Riche-Cannieu anastomoses are rare but important anomalies that explain unexpected deficits or unusual patterns of intrinsic hand function following injury. Historically, another obscure variation, the Froment-Ruber nerve, has been

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described as an anastomosis between the terminal branches of the posterior interosseous nerve and the deep branch of the ulnar nerve. This nerve also describes a rare anastomosis between the superficial radial nerve and the ulnar nerve in the first and second interosseous muscles. The goal of the present study was to document the incidence of this nerve variation in supplying muscles within the 1st webspace. Fifty-six upper extremities from cadavers were dissected under magnification to examine for the possibility of alternative motor axons arriving by way of the superficial radial nerve (SRN) or the posterior interosseous nerve (PIN). Superficial radial nerves were dissected in a proximal to distal direction toward the web space. Microscopic visualization indicated that 30% of the superficial radial nerves sent contributing branches into muscles of the 1st webspace. Specifically 25% were noted to penetrate into the first dorsal interosseous muscle (14 of 56) and 5% (3 of 56) were observed to continue into the adductor pollicis muscle. To confirm that these branches were serving motor functions in addition to their expected proprioceptive (sensory) roles, immunohistologic staining was conducted (n=42). Segments of the first dorsal interosseous muscle and adductor pollicis muscle containing penetrating branches from the SRN were harvested. In addition, nerve segments (2 cm) of the SRN were removed as they passed over the extensor retinaculum, and the PIN segments were harvested at this level as they passed dorsal to the interosseous membrane. Immunoreactivity to substance P was used as a selective marker to identify sensory axons, and acetylcholinesterase immunostaining was used to identify motor axons. A segment of the main radial nerve was harvested in the distal brachium to serve as an internal positive control. Five of the forty-two samples were discarded due to post-mortem autolysis. The samples of the SRN penetrating into the first dorsal interosseous or the adductor pollicis muscles exhibited a positive acetylcholinesterase staining pattern indicating the presence of motor axons. However, at the level of the extensor retinaculum, 30% of SRN and 28.5% of PIN showed substantial immunohistochemical evidence that these nerves contained motor neurons. In summary, classical teachings that the SRN and the terminal branches of PIN are exclusively sensory have been brought into question by our cadaver examination. Our data raise the possibility that 30% of patients who experience non-reparable destruction of the deep ulnar nerve might benefit from muscle strengthening therapies directed toward muscle fascicles receiving motor innervation from either the SRN or the PIN.

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OOMMEN Anitha, Avinash V MAINKER* and Tom OOMMEN. K.S. Hegde Medical Academy, Mangalore, and Colaco Hospital, Mangalore, INDIA. Symphysial angle of the mandible.

Despite different criteria being used to determine the sex of the mandible, it is still a matter of controversy. The symphysial angle of the mandible has not been a subject of study in currently available literature. The present study was undertaken therefore to determine the inner and outer symphysial angles of the mandible in both sexes and to establish whether the angles can be used as one of the criteria for determining the sex of the mandible. 60 mandibles of both sexes, including adult and old-age mandibles, were selected based on the currently accepted criteria. The inner and outer borders of the base of the mandibles were traced and the inner and outer symphysial angles were determined using three reference points, namely, the lower point of the symphysis menti and the points opposite the mental foramina. The statistical analysis showed no significant difference in the outer symphysial angle between male and female mandibles. However there was a significant difference in the inner symphysial angle between male and female mandibles. This finding establishes that the symphysial angle can be included as a criterion for determining the sex of the mandible.

OPACK*, Joseph M., Ryan N. DOBBS*, Nicholas D. FREUEN*, and Neil S. NORTON. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE. Demonstrating the clinical anatomy of the Gow-Gates nerve block using fresh tissue cadavers.

The Gow-Gates nerve block is a useful way to achieve anesthesia of the majority of the mandibular division of the trigeminal nerve. Initially developed to improve the success rate of the inferior alveolar injection, it is considered a "true" mandibular nerve block. It provides pulpal anesthesia to ipsilateral mandibular teeth from the central incisor to the third molar, all buccal and lingual gingiva, and occasionally the lateral temple. The target area is the condylar neck inferior to the lateral pterygoid attachment. We sought to explain the clinical anatomy of this block by investigating the distribution of anesthetic using fresh tissue cadavers. Using proper anatomical landmarks, a 1.8 ml carpule of 10% methylene blue was injected into the pterygomandibular space (PMS). Following dissection, digital images were recorded to trace the spread of the dye which filled the superior portion of the PMS enveloping the inferior alveolar, lingual, buccal, and auriculotemporal nerves. Improper technique causes the block to be unsuccessful or partially successful at best. Placing the needle too superior injected dye into the lateral pterygoid, possibly

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accounting for a trismus sometimes observed following a Gow-Gates. Additionally, when placing the needle too inferior, the buccal nerve was not affected by the dye.

OXBERRY, Brett A. Department of Anatomy and Cell Biology, Temple University School of Medicine, Philadelphia, PA. The Diagnostic Image Collection and Cross Section Navigator, computer based learning tools that help students learn basic radiographic and cross sectional anatomy.

The intensified use of diagnostic imaging techniques in the practice of modern medicine necessitates that all medical students acquire some basic ability to interpret diagnostic images early in their training. To address this need, we created two, CD-ROM based, computer applications to help our medical students taking gross anatomy learn to recognize anatomical structures and relationships that are visible in x-ray films and in cross sectional images from cadavers and live patients. These programs were designed to provide an engaging interactive environment. The user can quickly navigate to a series of images selected from a major region of the body. Alongside each image, a list of identifiable basic structures is provided. The user can click on any item in the list to reveal its location in the image. Conversely, the user can self-assess their ability to identify any structure in the list by placing the cursor on the image and clicking on the structure. In sectional images, the user can also seamlessly navigate to a higher or lower level cross section as well as toggle between a cadaver image and a correlated live patient CT image. Student evaluations of these programs over the past six years have established that they are very effective learning tools.

PARKIN Ian G, Rosana COBIELLA^{1*}, Eva MARANILLO^{2*}, Maria T. VAZQUEZ¹, Xavier LEON^{2*}, Jose SANUDO¹. Department of Anatomy. Cambridge University. UK, ¹Human Anatomy and Embryology I. Complutense University of Madrid, and ²Morphological Sciences Department. Autonomous University of Barcelona, SPAIN. Anatomical variations of the lingual artery.

The lingual artery (LA) is typically the second branch to arise from the external carotid, above the superior thyroid artery. Variations of the LA are described and these were investigated by anatomical dissection of 105 adult cadavers. In total 207 carotid arterial systems (95 male and 112 female) were studied to assess the origin and external diameter of the LA. The LA was observed arose from the external carotid artery (79,7%), which is the expected source, the

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carotid bifurcation (2,4%), the common carotid artery (0,5%) and joined in a common trunk to the facial or superior thyroid arteries (17.4%). The linguo-facial trunks were identified in 16.4% of cases, one arising from the carotid bifurcation, while only two thyroid-lingual trunks (1%) were identified, one arising from the common carotid artery. No thyro-linguo-facial trunks were found. The mean external diameter of the LA was 0.3 cm. with a Standard Deviation of 0.08 cm. (min=0.1; max=0.8 cm.). It has been larger in men ($p=0.027$). No other statistically significant differences between sex or side were found. Unexpected origins of the LA from the common carotid artery or the carotid bifurcation and associations with other collateral branches must be considered in neck surgery or radiology. (Supported by a grant N° PI030035 from the FIS)

PARKIN, Ian G, Jose SANUDO¹, Teresa VAZQUEZ, Ricardo. BRIME^{1*}, Juan CABELLO^{1*}, Helena ALVAREZ^{1*}, and Raffaele DE CARO². Department of Anatomy, Cambridge University, UK. ¹Department of Human Anatomy and Embryology I. Complutense University of Madrid, SPAIN. ²Department of Human Anatomy and Physiology, Section of Anatomy, University of Padova, ITALY. A digital dissector guide of human regional anatomy.

The aim of this work, in cooperation with a number of anatomy departments, was to create a free-access, easy to use, speedy web site to be consulted by medical students and health professionals. It will eventually include complete information related to the dissection procedure of any body region. Dissected material was obtained during practical sessions for first and second year medical students where different anatomical regions were dissected under the supervision of teachers and following a previously established protocol (classical guide of regional dissection by layers). Vascular structures and nerves were water-coloured after dissection before being digitally photographed and processed for inclusion in the web site (<http://www.ucm.es/info/morfos/atlasdisseccion/index.htm>). The presentation of each region was organized by layers (from skin to deep structures) and every layer has a photograph with a brief explanatory text. The most significant structures have been labelled. The web-site already includes the following chapters: how to perform a dissection, anatomical variations, a gallery of images, as well as a dissection guide for many regions, through a simple and intuitive index page. The regions described are currently being increased alongside the insertion of clinical cases with anatomical interest, radiological images, review questions and related links.

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PATEL, Dhaval M., Sai RAMASASTRY*, and Umberto, BAREATO. Department of Plastic and Reconstructive Surgery, University of Illinois at Chicago, IL. Francesco Parona and Parona's Space: A historical, anatomical and clinical review.

This paper will address a historical review of Francesco Parona, the anatomist and surgeon, anatomical review of Parona's space, and two clinical cases of Parona's space infection. There is extremely sparse amount of information available in literature on Francesco Parona and his description of the so called "space of Parona." Dr. Francesco Parona was born on January 11th, 1842 in Lodi city in Italy. He studied at the University of Pavia City, and obtained the medical degree in 1865. In 1871, he was chosen to be the chief of surgery in Maggiore Hospital in Novara city. Throughout his life, he was interested, and studied the surgical anatomy and various operating techniques to improve the surgical sciences. The space of Parona is a potential space that is found directly deep to flexor digitorum superficialis and directly superficial to flexor digitorum profundus. The anatomical knowledge of the space of Parona is imperative in hand surgery, since infection in this space usually requires prompt surgical intervention to avoid catastrophic outcome. We present two clinical cases of Parona's space infection. The first case in a 54 y/o male was due to direct puncture wound in the distal wrist. This was treated with volar incision. The patient had an excellent outcome. The second case in a 48 y/o female was due to the spread of infection from a neglected radial bursa infection. This was treated by drainage with good outcome. We conclude that with good anatomical knowledge of Parona's space and prompt surgical intervention, pt with Parona's space infection can have a very good outcome.

PORTA, David J. Department of Biology, Bellarmine University, and Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, KY. Tumor development and its relation to the sympathetic chain of a young girl.

Description of Horner's syndrome is a standard teaching tool and clinical correlation for anatomy professors wishing to emphasize the ascending portions of sympathetic pathways- particularly in relation to the eye. Paralysis of such fibers results in classic symptoms: miosis, anhydrosis, ptosis, et al. A current case involving a 13 year-old girl is presented with permission. Although a tumor was visible on CXR as early as 2 years of age, the only symptom at that time was anisocoria (indicating minor involvement of the lower ciliospinal pathway). Unfortunately, the tumor was allowed to progress for

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several years until it filled the top third of the left thoracic cavity. At surgery, an extra-pleural ganglioneuroma was excised. The only complication was the necessary removal of the left sympathetic chain from T-1 to about T-7. She has been diagnosed with Horner's syndrome but her deficits are considerably greater. They involve the left upper extremity as well as the left thorax. Interestingly, the young lady has diminished hair growth (in the axilla in particular) on the affected side. Medical images and photographs taken throughout development of this unique case will be presented since it may serve as an enhanced teaching tool.

PHAM^{1*}, Diane, Brandie BLACK^{1*}, and Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. False tendons: an alternative imaging technique to fill the gaps left by echocardiography.

False tendons (FT) have been extensively described and recognized by gross anatomic studies. However, in the clinical setting the recognition of FTs is limited to the use of ultrasound. In order to provide a more complete anatomic and physiologic correlation of the actual incidence and distribution of the FT we examined 200 formalin fixed hearts, with gross dissections, ultrasound and endoscopy. After macroscopic observation the FT were sectioned and stained with H & E. Gross examination was able to identify FT in 128 specimens (62%) while echocardiographic imaging was only able to identify 56 specimens (28%). Through endoscopic imaging we were able to identify the same number of specimens as in gross. Neither the incidence nor the location of FT varied appreciably with age. Of the 128 specimens containing false tendons, 50 (39%) exhibited two or more. Of these, 50% were located between the posteromedial papillary muscle and the ventricular septum, between the two papillary muscles, between the anterolateral papillary muscle and the ventricular septum, and between two aspects of the free wall. FT with three or more points of insertion (weblike) were also observed. Morphometric evaluation of the false tendons was performed: the range of the FT was from 3.2 mm to 26 mm. However, a certain percentage (30%) of the FT, irrespective of their location, carried conduction tissue fibers, which may implicate them in the appearance of arrhythmias.

PIEKUT, Diane T. Department of Neurobiology and Anatomy, University of Rochester, Rochester, NY. Revisiting Applied Gross Anatomy- an elective for 4th year medical students.

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Medical education in the United States has been experiencing an era of curriculum reform. Curriculum hours devoted to basic sciences, particularly Gross Anatomy has steadily declined. However, the acquisition of a critical anatomical knowledge base is essential for students pursuing careers in specialties such as surgery, radiology, etc. An elective was designed for fourth year medical students that focused on revisiting gross anatomy. It incorporated the three core objectives of the Double Helix Curriculum at the University of Rochester: to revisit basic sciences in year four; to promote student-centered learning; and to promote life-long learning. This elective was tailored to meet the needs of individual students. Each student identified their learning objectives, selected personal learning resources and set boundaries for independent study. Student time was divided between advanced and specialized cadaver dissections and preparation for presentations which focused on clinical correlations to their anatomical dissections. Additionally, each student developed a portfolio which included their presentations and relevant material generated from their personal learning resources. In summary, this elective facilitated active learning by creating a rich, student-directed learning environment. It can serve as a model for other electives—review of basic science applied to the clinical setting, learner focused, and learner specific. (Sponsored by Dean's Teaching Fellow Program).

PIETRASIK^{1,4}, Kamil, Leopold BAKON^{1,3}, Ireneusz NAWROT^{*4}, Pawel KRAJEWSKI^{*2}, Magorzta BRZOZOWSKA^{*2}, and Bogdan CISZEK^{*1} ¹Department of Anatomy, ²Department of Forensic Medicine, ³1st Department of Radiology, ⁴Department of General, Vascular and Transplant Surgery, The Medical University of Warsaw, Poland. Comparison of radiologic and *in situ* studies on initial parts of lumbar arteries.

Lumbar arteries play significant role in development of “endoleak” – most frequent complication of endovascular treatment of abdominal aortic aneurysm (AAA). *In situ* studies were conducted on 60 unfixed human cadavers [18 (30%) female, 42 (70%) male]. Mean age was 46 years, mean length was 169 cm. Points of origin of lumbar arteries were related to the vertebral column. In radiologic part of the study 150 aortograms from 50 cadavers [15 (30%) female and 35 (70%) male] were analyzed. Mean age was 47 years, mean length was 168. Points of origin of studied vessels were related to the vertebral column on aortograms performed in antero-posterior and lateral projections. In the last part of the study comparisons of the results performed *in situ* and on aortograms as well as between

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different aortogram's projections were made. All differences were statistically verified. Mean levels of the point of origin of lumbar arteries *in situ* were: first lumbar artery - inferior 1/3 of the L1, second lumbar artery - inferior 1/3 of the L2, third lumbar artery - middle 1/3 of the L3, fourth lumbar artery - superior 1/3 of the L4. There were not any statistically significant differences observed between sides and measurements performed on lateral aortograms. Mean levels of the points of origin of lumbar arteries measured on antero-posterior aortograms were: first lumbar artery - middle 1/3 of the L1, second lumbar artery - middle 1/3 of the L2, third lumbar artery - superior 1/3 of the L3, fourth lumbar artery - superior 1/3 of the L4. There were not any statistically significant differences observed between sides.

On the basis of conducted studies and statistical verification of gathered data following conclusion were drawn: 1. points of origin of lumbar arteries from abdominal aorta measured in relation to vertebral column on aortograms performed in antero-posterior projection are 1/3 of lumbar body height higher than on aortograms performed in lateral projection (except fourth pair of lumbar arteries), 2. results of measurements performed on lateral aortograms are in accordance with *in situ* results, 3. lateral aortogram provides better visualization of initial parts of lumbar arteries and should be preferred projection in diagnostic and therapeutic procedures involving these vessels. (Sponsored by Grant No. 6P05C01821 from the Ministry of Scientific Research and Information Technology Republic of Poland).

POLAK*, Martyna, Anna MIS* Niket SONPAL*, Jerzy St. GIELECKI*#, Anna ZURADA*, Pawel RDES*, and Bozena SYC*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. #Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). Is direct contact with cadavers valuable and necessary? Similarities and differences as they apply to English and Polish division medical students.

Gross anatomy has frightened students by its magnitude of information and cadaver work. To evaluate differences in student views on working with cadavers and their study habits a 22 question "multiple choice" survey was developed and distributed to students at the Medical University of Silesia in Katowice, Poland. Of the 356 who completed the survey, 23 were ED-MS1, 239 were PD-MS1 and 94 were PD-MS2. The results of the survey display many striking differences and unexpected similarities amongst both groups of students. 60% or more of each group stated they knew they will have contact with cadavers, yet still when walking into a dissection

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room, both PD and ED (>65%) described their initial feeling as curious and anxious. Amongst the ED, 56% report that they were not afraid, but slightly nervous of their first contact with cadavers, while 64%^{PD-MS1} and 40%^{PD-MS2} viewed their contact as educational to their future work as physicians. For exam preparation both groups report studying with cadavers as the prime means (>65%) to learn more while atlases are the secondary source of information. Therefore the cadaver experience is an invaluable encounter to both PD and ED students and gives evidence for the expansion of this program.

POLAK* Martyna, Marek SZCZECHLA*, Nirali PATEL* Niket SONPAL*, Jerzy St. GIELECKI*#, Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. #Department of Anatomical Sciences, Medical School, The University of Adelaide, Adelaide SA 5005, AUSTRALIA. (sponsored by S. W. Carmichael). Digital-image analysis of variations in lateral cord of the brachial plexus in human fetuses.

The brachial plexus is a significant clinical and surgical landmark. At the Medical University of Silesia in Katowice, Poland a study was performed to analyze variations and development of the lateral cord as well as its interactions with other communications of the brachial plexus. The investigations were performed via digital image analysis (Nerve-analyzer 2005) on 28 (14 female & 14 male) spontaneously aborted fetuses in the age between the 15 & 30 fetal weeks; resultantly 46 (20 right & 26 left side) brachial plexuses were dissected. Many variations were found upon inspection of the lateral cord; including 5 cases of the dorsal scapular nerve arising from the C5 root, 5 from the superior trunk, as well as one case of the dorsal scapular nerve arising from the posterior division of the superior trunk. Furthermore 10 cases of C4 prefixing into C5 were seen. Developmentally, a significant positive correlation ($p < 0.05$) between the age and diameter, as well as age and length, of the superior and middle trunk was observed. The importance of being aware of variations in development of the brachial plexus can be an important factor in the clinical setting, as it may explain many pathologies without rudimentary causes.

POZNANSKI, Ann A.*, Thomas R. GEST, and David A. JAMADAR*, Division of Anatomical Sciences, University of Michigan Medical School, Ann Arbor, MI. An analysis of ultrasound training and usage in the United States and other countries.

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Ultrasound is a valuable and cost effective technique for diagnosis and investigation in many areas of medicine. As ultrasound machines of smaller size and lower cost are becoming more widely available, the use of this technique should increase. We were interested in investigating the differences in training and usage of ultrasound between the United States and other countries. In order to assess this, a questionnaire was sent out to anatomists and clinicians from a variety of fields. Questions were included on context of ultrasound training, in which country training occurred and at which stage of career. Additional questions related to frequency of ultrasound use, and opinions regarding the utility of training and use for this technique. Results from the analysis of responses to this questionnaire will be presented.

RAJU*, Priya, Anne M. R. AGUR, and Monica BRANIGAN*. Program for Advice and Support of Students, Departments of Surgery and Family and Community Medicine, Faculty of Medicine, University of Toronto, Toronto, ON. Social support among medical students: An exploration using Playback Theatre.

Many medical students report reluctance to confide in their colleagues about the personal difficulties they may be experiencing in the program, and seek the social support important to mental health (Sykes, 1985). The purpose of this study was to explore barriers to social support among medical students, using a drama-based format called Playback Theatre. Playback Theatre is performed by a group of actors and musicians trained to distill out the essence of a story offered by an audience member, and express symbolically on stage the feelings and thoughts involved. The audience is then encouraged to discuss the issues raised in the scene. Eight first-year medical students were recruited to reflect on their experiences in the M.D. program, by participating in a session of Playback Theatre followed by a focus-group-style discussion. Their interaction was generally collegial, but marked with episodes of defensiveness and inhibition. Playback Theatre enabled the students to explore issues of pressure and competition in their class, which could be seen as inhibiting disclosure and social support. They also described positive experiences and healthy peer relationships that had grown despite those negative forces. The students felt that the format of the session, including Playback Theatre, provided an effective forum for honest dialogue in a safe and accepting environment, and expressed interest in participating in similar sessions in the future.

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RAOOF, Ameer M., Christina I. BAUMANN*, Katherine C.FALK*, Natalie M. HENDON*, Longping LIU*, Adriane C. MARCHESE*, Lauren A. MARCHESE*, Rishi P. MEDIRATTA*, Neda MIRAFZALI*, Jacqueline L. MUNCH*, Christopher M. PARRIS*, Michael T. WELLS*, and Heping ZHAO*. Division of Anatomical Sciences, The University of Michigan Medical School, Ann Arbor, MI. Expanding the role of plastination in anatomy education. Since the introduction of plastination about three decades ago, anatomical specimens preserved in silicone have been broadly used in medical schools as a valuable resource to gross anatomy education. At the University of Michigan Medical School, plastinated specimens have become an essential part of medical, undergraduate, and dental anatomy education. The newly implemented, system-based, integrated medical curriculum necessitated the introduction of a different set of specimens that are more relevant to the new curricular approach. The aim has been to demonstrate systemic and essential concepts in anatomy in order to promote students' independent learning. In the undergraduate "Introduction to Human Anatomy" course, laboratory visits were introduced into the syllabus where pertinent plastinated specimens were displayed. During the visits, faculty using these specimens explained the anatomical and the clinical relevance of the related systems. In the dental anatomy sessions, there has been more reliance on the use of plastinated specimens that demonstrate essential and inaccessible areas in the head and neck region. The new approach in preparing these specimens is planned for a wider application of plastination in the future to facilitate comprehension of anatomical knowledge and to assist faculty and students in the effective utilization of the time allocated to anatomy.

RAOOF, Ameer M., and Sakti SRIVASTAVA. Division of Anatomical Sciences, The University of Michigan Medical School, Ann Arbor, MI. Anatomy & Surgery Applications, University of Stanford Medical School, Stanford, CA. Using Internet2 to learn clinical anatomy of the knee joint: An interactive, collaborative stereoscopic lesson.

Two current challenges facing anatomy education are the shortage of qualified educators and the paucity of interactive learning resources. The Stanford University and University of Michigan medical schools ran an innovative teaching methodology where remote users collaborated using Internet2. One anatomist from each institution jointly conducted a session with two students on the applied anatomy of the knee joint. Stereoscopic images from fresh cadaver dissections were used with the Remote Stereo Viewer

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(RSV), an educational application that provides students the ability to view three-dimensional stereo images of a specific anatomical section of the body in a client-server mode. Additional images from the Visible Human project were put together in the form of short movie clips. All users were connected using audio-video conferencing over the Internet. Both anatomists quizzed the students at the end of the session. All users and researchers completed a questionnaire in order to get feedback with respect to quality and performance. Faculty and students rated all aspects of the session favorably. The success of this pilot session encourages us to implement this teaching methodology on a wider scale with more students and for more topics. We hope this will provide a solution to some of the critical issues facing anatomy education today.

REGAN*, Annie E., and Gregory R. SMITH. Department of Biology, Saint Mary's College of California, Moraga, CA. Anatomic QuickTime movies: A practical application for creating an individual library of laboratory models and specimens.

Visualizing anatomical specimens is challenging for many students in anatomy. Our objective is to create a CD library of interactive QuickTime (QT) movies that will assist students in overcoming this challenge. Recent projects have demonstrated that creating QT movies of anatomic specimens is possible, however, such projects describe a process that can be time intensive and require an elaborate equipment set-up. Also, the movies available are limited to the developers' libraries. This project demonstrates that creating QT movies can be accessible to educators at all levels. Creating high quality QT movies that specifically relate to each lab curriculum will provide consistency between laboratory experience and extra-laboratory study. In order to generate the QT movies, a bench-top studio was created to photograph specimens and models. The minimum set up to create a movie consists of the following items: a turntable, digital camera and QT authoring software. The software was used to create the object movies. These movies were then imported to a navigational database. As a result, a library of QT movies has been developed. This project demonstrates that one can easily make QuickTime movies of nearly any anatomical object. The selection list of specimens is limitless.

REED^{1*}, Lesley, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard

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Medical School, Boston, MA. A new description of a thoracic venous arch bridging the internal thoracic veins.

Branching pattern and adequacy of the Internal Thoracic Vein (ITV) are important factors providing useful information on availability of vessels and appropriateness as an option for anastomosis. The frequent appearance of two comitant veins on both sides might offer the chance to make two vein anastomoses in order to reduce venous congestion. The (ITV) is formed by the venae comitantes of the internal thoracic artery (ITA), that unite opposite the third costal cartilage to form a single vein that usually lies medial to the ITA. The tributaries of the ITV correspond to the branches of the ITA. During 100 cadaveric examinations, of the anterior thoracic wall, it was observed that the medial venae comitantes were connected to each other by a transverse, oblique, U shaped venous arch, anterior to the xiphosternal joint in all the specimens. This arch is a venous connector between the right and left medial venae comitantes of the ITVs, and no artery accompanied it. Interestingly, a triangular venous loop was formed at the origin of the left ITV but no such structure was found on the right. When the sternocostal head of the pectoralis major muscle was removed, the lateral ends of the venous arch could be seen entering the thorax between the xiphoid process and seventh costal cartilages. The distance from sternum to ITV gradually decreased, as it passed caudally, as did the diameter. More detailed knowledge of the anatomy of the ITV may prove useful in planning surgical procedures in the anterior thorax in order to avoid unexpected bleeding

REEVES, Rustin E., Armando A. ROSALES, and Harold J. SHEEDLO*. Department of Cell Biology and Genetics, University of North Texas Health Science Center, Fort Worth, TX. Human anatomy: The perfect tool for stimulating K-12 teachers' and students' curiosity about science.

At UNTHSC, human gross anatomy is an integral part of our institution's outreach programs. The Teachers As Scholars program is offered to area science teachers emphasizing anatomy-based workshops. These workshops give teachers training on individual body systems in a medical school environment, and allow them to experience hands-on dissection of human cadavers. Sixth-grade students in the Summer Science Camp take a weeklong course that emphasizes the anatomy, histology and physiology of the cardiopulmonary system of the human body. This hands-on activity allows them the opportunity to examine normal and diseased organs and tissue. Students in our NIH and NSF sponsored outreach

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programs visit our campus on field trips exposing them to human anatomy and dissection in a medical school environment. One goal of this activity is to stimulate students' interest about the anatomy of their body and direct them in ways to keep it healthy. For upper level high school science teachers and undergraduate students, faculty members in our department routinely develop anatomy-based projects for summer research internship programs and advanced workshops in anatomy, allowing us to extend the boundaries of our outreach programs to areas outside the state of Texas.

REZAIAN, M; and R. PANDJSOTOON*. Division of Histology, Department of Basic Sciences, Faculty of Veterinary Medicine, Tehran University, Tehran, IRAN. Histological study of the guttural pouches in Caspian miniature horses.

The guttural pouches (diverticulum's of auditory tubes) of five healthy adult Caspian Miniature Horses were studied histologically. Each pouch was dissected separately and samples were taken from the lateral wall and medial wall of them and fixed with 10% buffered formalin. Routine histological laboratory methods were used and 6µm paraffin sections were stained with hematoxylin- eosin staining method and studied under light microscope. The sacs or pouches were covered by a thin layer of mucous membrane which was loosely attached to the surrounding structures. They lined with pseudostratified ciliated columnar epithelium with large number of goblet cells. The lamina propria was loose connective tissue and contained small amounts of sero-mucous gland. Serous acini were more abundant. There were no muscularis mucosa and muscularis layer. Submucosa contained dense collagenous connective tissue.

ROSATELLI, Alessandro and Anne M. R. AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, Canada. Architecture of the human lumbar multifidus: A pilot study.

The purpose of this study was to develop a method to assess the detailed architecture of the lumbar multifidus. Architectural parameters of the lumbosacral multifidus in 7 cadaveric specimens were obtained using serial dissection and digitization of individual fiber bundles in situ. The muscle was then modeled in 3D using MAYA™. Architectural parameters (fiber bundle length, angle of pennation, and extent of tendons/aponeuroses) were quantified. Lumbar multifidus is architecturally partitioned into distinct regions (superficial, intermediate and deep). Mean fiber bundle lengths decreased from superficial to deep (superficial 70mm, intermediate

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45mm; deep 27mm) while mean pennation angles decreased from deep to superficial (deep 20°; intermediate 18°; superficial 15°). Superficial multifidus originates via a common tendon from the tips of the spinous processes and spans infero-laterally to attachment onto the mammillary processes, sacrum and ilium. In contrast, intermediate multifidus has a broad origin to the base of the spinous processes and a tendinous attachment to a single mammillary process. The deep portion of multifidus is entirely muscular, consisting of short fiber bundles. Lumbar multifidus has distinct regions. Functional implications based on muscle architecture: superficial multifidus produces spinal extension, intermediate multifidus assists in reducing compressive forces through the lumbar spine and discs, and deep multifidus provides proprioceptive feedback. Spinal mobility/stability may be compromised when there is pathology in one or more of these parts.

ROSATELLI, Alessandro, Sam CHHAYA and Anne M. R. AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, Canada. Musculoskeletal Radiology, University of Texas Health Science Centre at San Antonio, San Antonio, TX. Age related changes of the morphology of the interosseous region of the sacroiliac joint: Functional implications.

To document and quantify the morphology of the interosseous region of the sacroiliac (SI) joint. Methods: Eleven cadaveric specimens (9 formalin embalmed/2 fresh frozen) were studied. Ten specimens were 55 years of age or older and one was 20 years old. To view the interosseous surfaces of the sacrum and ilium the specimens were either axially sectioned (1cm slices) or disarticulated. Surface ridging and areas of ossification of the interosseous region of the sacrum and ilium were quantified. In two specimens the surfaces were digitized and reconstructed in 3D using MAYA™. All specimens 55 years of age or older were found to have moderate to extensive ridging of the interosseous surfaces of the sacrum and ilium. In addition in six specimens the interosseous sacroiliac ligament had ossified centrally, effectively fusing the posterior aspect of the sacrum and ilium. The 20 year old specimen showed a slight ridging pattern and no evidence of ossification. Increased ridging of the interosseous bony surfaces and ossification of the interosseous SI ligament will further limit mobility through the SI joint complex. The use of mobility tests for the SIJ may therefore become progressively more unreliable with an older age cohort of patients.

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ROSENBAUM*, Benjamin P.¹, Sanjay G. PATEL*¹, Davin W. CHARK*¹, H. Wayne LAMBERT². ¹Vanderbilt University School of Medicine, Nashville, TN. ¹University of Louisville School of Medicine, Anatomical Sciences and Neurobiology, Louisville, KY. Making an interactive web-based histology atlas more functional and adaptable for medical students.

At Vanderbilt University, an interactive web-based histology atlas was developed through cooperative efforts of faculty and students. The atlas was transformed into a dynamic database-driven tool through utilization of a MySQL database and the PHP scripting language. The advantages of this transformation are substantial. For the faculty, data associated with the histological images can be manipulated quickly and painlessly to affect the entire website. In addition, the potential for implementation of database-driven features is vast. In one semester, features such as practice exams, keyword searches, slide lists, and site usage analysis took minutes to develop. Also, consistency in site design is maintained by using one common layout and script for all images and data represented. This setup decreases the number of errors and ensures a functional site that has been thoroughly tested on multiple platforms. For the medical students, the unlimited potential of having a database-driven interactive atlas is exciting because it can quickly be adapted to meet their educational needs. The implementation of a database-driven histology atlas has been well received by students and faculty due to the ease of data entry, its functionality, and the unlimited potential to adapt to meet the pedagogical demands of students.

SADAHARU,* Kitashima^{1,2}, Tsuyoshi SAGA*¹, Kei-ichiro NAKAMURA*¹, and Koh-ichi YAMAKI*¹. ¹Department of Anatomy, and ²Department of Dental and Oral Medical Center, Kurume University School of Medicine, Fukuoka, JAPAN. Morphological alterations of submandibular glands caused by cisplatin in the rat.

Cisplatin is a platinum-containing antineoplastic agent, widely used in the treatment of various malignant neoplasms including head and neck cancer. In this study, we examined ultrastructural changes of rat submandibular glands (SMGs) after cisplatin treatment. Male Wistar rats aged 8 weeks were used in the experiments. Cisplatin was injected intraperitoneally in rats (5 mg/kg/day) for three consecutive days. After 1, 3, 5, and 7 days, the SMGs were removed and observed under an electron microscope. Vacuolation of cells appeared on the first day after cisplatin treatment. On the third and fifth day, irregular arrangement of rough surfaced endoplasmic reticulum, swelling of mitochondria, and the presence of autophago-

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lysosomes were observed. On the seventh day, the damage to organelles began to decrease and the SMG exhibited a tendency towards improvement.

SATO,* Tatsuo, Hirokazu SAKAMOTO¹, Sadaaki HEIMA, Yoko TSUBOI, Kumiko YAMAGUCHI, and Keiichi AKITA, Clinical Anatomy, Tokyo Medical and Dental University Graduate School, and ¹Division for the Visually Impaired, Tsukuba College of Technology. Comprehensive understanding of the continuity of abdominal and pelvic visceral fasciae.

Recently numerous studies have been carried out on the pelvic fascia. Our knowledge of the detailed topography of the complex fascial layers has increased. However, as the pelvis is a continuation of the abdomen, we must have a comprehensive understanding of the continuity of the fascial layers and their relationships. Considering the renal fascia, it does not simply include the kidney, rather it includes the renal vessels, aorta and inferior vena cava, ureter, and the autonomic nervous plexus. In the pelvis, the complicated fascial layers can be very roughly considered as three modified layers: anterior, middle and posterior. The anterior fascial layer (provisionally, testiculo-deferential fascia) is comprised of the testis, testicular vessels, ductus deferens and spermatic cord. The middle layer (provisionally, uretero-hypogastric fascia) includes the ureter, superior hypogastric plexus and hypogastric nerves. The posterior layer contains the aorta, IVC and common iliac vessels; it continues between the internal iliac vessels and the umbilical artery as the so-called vesicohypogastric fascia or hypogastric wing. From this viewpoint, we performed special dissections of pelvic fascial layers, preserving the continuation with the abdominal fasciae. Video demonstration of this dissection provides a unique view to visualize the 3-D relationships of these fasciae.

SAKAMOTO, Yujiro, and Keiichi AKITA*. Oral and Maxillofacial Biology, and Clinical Anatomy, Tokyo Medical and Dental University, Tokyo, JAPAN. Distribution pattern of glossopharyngeal and vagus nerves to pharyngeal muscles in human.

There has been little information on the spatial interrelationships of the pharyngeal muscles and innervating branches. We investigated the innervation of the pharyngeal muscles by the glossopharyngeal and vagus nerves. Twenty head halves of ten cadavers fixed with 8% formalin were used in this study. After bony elements were removed, the muscles and nerves were dissected under a binocular microscope. The nerve branches descended the dorsal surfaces of

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the constrictor muscles, and their twigs entered into the spaces between the superior, middle and inferior constrictors. They supplied the muscles from dorsal and ventral surfaces. Some twigs pierced the superior constrictor to supply the salpingo- and palatopharyngei. Whereas the glossopharyngeal nerve passed the dorsal surface of the stylopharyngeus, it sometimes penetrated the muscle. The twigs from the glossopharyngeal nerve supplied the stylopharyngeus and sometimes pierced it to supply the superior constrictor. The results suggested that pharyngeal muscles are classified into segmental layers: (1) the stylopharyngeus, (2) the salpingo- and palatopharyngei and the superior constrictor, (3) the middle constrictor, (4) the inferior constrictor. The first layer is innervated by the glossopharyngeal nerve, the second and third layers by the glossopharyngeal and vagus nerves, and the fourth one by the vagus nerve.

SALKOWSKI, L. R. Department of Radiology, Medical College of Wisconsin, Milwaukee, WI. A New Method of Integrating cross-sectional imaging and dissection in clinical anatomy.

Various methods of incorporating radiographs and cross-sectional imaging have been used in the anatomy lab. Here is a new approach of integration using computed tomography of the preserved anatomical donation prior to student dissection. The axial image set are made available to the students on a web page which can be accessed in the lab for active cross-reference of the live dissection and the cross-sectional images. Although only 25% of the dissected bodies were scanned in this study, 35% of the students believe that the CT scans enhanced the understanding of the 3-dimensional relationships of structures within the body, compared to only 18% who did not experience this relevance. Forty-five percent of the class would like to see this method of teaching continue, compared with only 11% who would not. Overwhelming, the students believe that this experience would be enhanced by small group sessions (66%) and would attend if smaller sessions were offered in addition to the regular lab time (42%). This method of implementation of cross sectional imaging into the clinical anatomy course has merit, and with a few modifications this method would fortify the cross-sectional experience and supplement the preparation of students for clinical medicine.

SAXTON, Ernestina H., James D. Collins, Theodore Q. Miller*, Samuel S. Ahn*, and Alfred Carnes*. Departments of Radiological Sciences, Neurology and Vascular Surgery, David Geffen School of

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Medicine at UCLA, Los Angeles, CA. MRI, MRA and MRV display costoclavicular compression and collateral venous drainage into the facial and vertebral veins in patients with thoracic outlet syndrome (TOS) and migraine

Bilateral multiplanar magnetic resonance imaging (MRI), angiography (MRA) and venography (MRV) display sites of bicuspid valve compression (costoclavicular) within the veins of the neck and supraclavicular fossae, and neurovascular bundles (Clin.Anat.1995; 8:1-16). Venous compression expands fascial planes and triggers commonly recognized complaints of pain with tingling and numbness of the upper limbs. In addition, these patients also present with headache; facial and jaw pain, and visual blurring, "spots", floaters" and eye pain. Imaging conducted on the 1.5 Tesla (GE Signa LX) magnet in the coronal, transverse, transverse oblique, sagittal planes, and in the abduction external rotation with 4.0mm thickness and 512 x 256 matrix size captures T1-weighted and 3-D reconstructed images displays the anatomic sites of peripheral vascular compression and the pattern of collateral venous drainage in and around the eye (vorticoose veins) into the facial vein, and from the dural sinuses (condylar veins) into the vertebral veins. This presentation displays venous compression and collateral drainage into the facial and vertebral veins in two patients with severe headache, facial and eye pain, swooshing sounds in the ears and neck and shoulder pain. Multiplanar MRI is the preferred modality for diagnosis and management of TOS and migraine patients.

SCHALOP*, Lee, Sherry A. DOWNIE, Jonathan N. MAZUREK*, Gily SAVITCH*, Gary J. LELONEK*, and Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. Bilateral duplicated internal jugular veins: case study and literature review.

A rare bilateral duplication of the internal jugular veins (IJV) was discovered during cadaveric dissection of a 54-year-old woman. From their origin at the jugular foramen, each IJV descended as a single vessel to the level of the hyoid bone before they divided into medial and lateral veins. The medial IJVs traveled in the carotid sheath and the lateral IJVs coursed posterolateral to the sheath across the posterior triangle of the neck. On the RIGHT SIDE, the medial IJV received the common facial, lingual, superior and middle thyroid veins while the lateral received the transverse cervical vein. The medial and lateral IJVs separately entered the subclavian vein. The external jugular vein was present but abnormal on the right side. It passed between the heads of the SCM, received the suprascap-

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ular vein, and emptied into the subclavian vein anterior to the lateral IJV. Ventral rami from C2 and C3 as well as the suprascapular artery passed between the duplicate IJVs. On the LEFT SIDE, the medial IJV received the common facial, lingual, and superior thyroid veins before draining into a large bulbous jugulovertebrosubclavian (JVS) sinus that received six additional vessels. From its origin, the lateral IJV diverged posterolaterally from the medial IJV. At the border of the trapezius muscle, it received the transverse cervical vein and then turned sharply anteromedially to drain into the JVS sinus. The lateral IJV also gave rise to an aberrant additional large vein at its junction with the transverse cervical that passed laterally around the omohyoid muscle before independently entering the JVS sinus. The straight medial and two lengths of the sharply angulated lateral IJV formed a large triangle within the posterior triangle of the neck. In the English literature, we found eight publications (twelve cases) on unilaterally duplicated or fenestrated IJVs and *none* on bilateral duplications. We report a case of bilateral IJV duplication with other notable vascular anomalies, and discuss duplication versus fenestration as well as the clinical significance of IJV anomalies. The findings presented here underscore the value of cadaveric dissection in anatomical education and clinical research

SHAFER-CRANE, Gail A.*; Ronald A. MEYER, Marcy C. Schlinger, D. Lee Bennett, Kevin C. Robinson, and James J. Rechten*, Division of Anatomy and Structural Biology, Department of Radiology, Michigan State University, East Lansing, MI. MRI changes in the median nerve related to occupational typing.

Project investigators measured the effects of occupational typing on median nerve shape and T2 relaxation, and on forearm muscle T2, in professional typists with and without symptoms of carpal tunnel syndrome. Based on the Levine Carpal Tunnel Syndrome Symptom Severity Scale (LCTSS), twelve female professional typist volunteers were divided into asymptomatic (LCTSS<1.3, n=5) and symptomatic (LCTSS>1.3, n=7) groups. Magnetic resonance images were acquired from wrist and forearms of all subjects before, immediately after, and eight hours after 3 hours of typing. Forearm muscle T2, and median nerve T2, cross-sectional area, and long/short axis ratio were evaluated by blinded observers. There was no difference between groups in any measured parameter prior to typing. Median nerve T2 increased, and long/short axis ratio decreased in asymptomatic subjects after typing, but there were no significant changes in symptomatic subjects. T2 increased in finger flexor muscles after typing, but there was no difference in the pattern of

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muscle T2 changes between groups. Swelling and increased T2 of median nerve in MR images at the carpal tunnel are a normal response to typing, and may be less likely to occur in subjects with symptoms of carpal tunnel syndrome.

SHAFER-CRANE, Gail, Connie OSBORN*, and Wendy LACKEY*. Division of Anatomy and Structural Biology, Department of Radiology, Michigan State University, East Lansing, MI. Benefits of virtual microscopy in teaching histology to first year medical students.

Medical Histology for 250 first year medical students has evolved into a concentrated course within Physiology 534 and 535 Courses at Michigan State University College of Human and Osteopathic Medicine. Microscopic subject matter has evolved from light to virtual microscopy over a five-year period. Students initially shared a light microscope and box of 100 glass slides with one partner. Instructors provided a short pre-lab discussion. Most students attended the pre-lab, approximately 10% remained for the entire 2-hour lab session. The current computer laboratory contains 24 virtual microscopy workstations, 72 students in each session are instructed with active learning techniques. Instructors project slides to the workstations, outline and label structures, and then solicit responses to sample test problems practiced during ifreei investigational time lab. Attendance increased through the duration of the 2-hour laboratory session. Interactive learning coupled with virtual microscopy has increased student participation in the laboratory experience. Student confidence in verbal reporting, and improved on task interaction and cooperative learning has increased. Avoidance behavior, including refusal to answer questions in class, has been limited, despite student surveys that indicate dissatisfaction with being called upon and listening to responses from fellow students. Computer examination will be initiated this fall.

SILVERMAN*, Bruce, Kevin HOLMAN*, Nathan DONALDSON* and David J. ELIOT. Touro University - California, Vallejo, CA. A cadaver dissection case: a right descending aorta with other vascular anomalies.

A right aortic arch was discovered during the course of student dissection of a cadaver. The aortic arch passed to the right of the trachea and esophagus. The descending thoracic aorta began slightly to the right side of vertebral bodies then traversed the spinal column to pass through the diaphragm in the normal position. The four great arteries branched from the aortic arch separately in the

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following order: left common carotid, right common carotid, right subclavian and retroesophageal left subclavian. The last of these took origin from end of the aortic arch, posterior and slightly to the right of the esophagus. The ligamentum arteriosum was 35 mm long and particularly well-defined. It originated from the pulmonary trunk, biased toward the left pulmonary artery. Distally it connected to the left subclavian artery 15mm from the origin of that artery. Gross dissection of the heart revealed nothing unusual. The left recurrent laryngeal nerve recurred around the ligamentum arteriosum. The right recurrent laryngeal nerve branched from the vagus nerve inferior to the aortic arch then ascended medial to the aortic arch and the right common carotid artery. The clinical implications, genetic associations and embryological development of this anomaly are considered.

Silverstein, Samuel C., and John C. Dalton. Columbia University, New York, N.Y. Practice what you teach: Columbia University's Summer Research Program for secondary school science teachers.

Concerns about the quality of science education led to the founding of Columbia University's *Summer Research Program* in 1990. The program enrolls ten new teachers each summer. It provides teachers with paid fellowships (\$6,000/summer) to participate full-time in ongoing scientific research under the mentorship of Columbia University scientists for two consecutive summers. Teachers are selected on the basis of commitment to teaching and evidence of innovation (e.g., implemented new curricula/labs). Teachers gain hands-on experience with cutting-edge concepts and technologies, with contemporary practices and practitioners of science, and with the environments in which research is performed. These experiences enhance teachers' understanding of the vitality of science and its relevance to daily life, and stimulate them to develop new types of classroom and laboratory exercises. Outcomes research shows: 1. Eleven percent more students in science classes of teachers who have completed Columbia's program pass a New York State Regents examination in science than students of non-participating teachers in the same science departments. 2. Program participation is associated with increased retention in teaching. 3. Cost-benefit analysis shows that the program provides between \$4 and \$7 in cost savings and revenues to city, state and federal government for every \$1 invested in it.

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SINHA, Amit*. Russells Hall Hospital, Department of Surgery, Dudley Group of Hospitals NHS Trust, UK. Diverticulitis of a true caecal diverticulum - clinical pictures.

Diverticulitis of a true caecal diverticulum is an uncommon condition. It is usually diagnosed at surgery for suspected appendicitis. Its appropriate management has been a matter of debate varying from use of antibiotics if the diagnosis is made pre-operatively to the suggestion that right hemicolectomy or ileo-caecal resection should be done in all cases. Despite being a congenital condition its incidence in children is low. This is a case of caecal diverticulitis in a 12 year old boy who was treated with diverticulectomy and primary closure using Vicryl with good effect. The pictures illustrate very clearly the different layers found in a true caecal diverticulum. With forceps are applied to the mucosa; a separate muscle layer clearly lay between this and the serosa.

SITU*, Gloria, Anne M.R. AGUR, Jodie JENKINSON*, and Nicolas WOOLRIDGE*. Biomedical Communications, Institute of Communication and Culture UTM, Division of Anatomy, Department of Surgery, University of Toronto, Toronto, CANADA. Rotator cuff muscles: a three-dimensional educational tool utilizing animation and video.

Health care professionals are often required to explain difficult concepts and techniques to patients and students, often without appropriate visual resources. The purpose of this study was to create an interactive 3D teaching module on the rotator cuff muscles for student and patient education. The resource consists of 3 sections: (1) musculoskeletal anatomy of the rotator cuff; (2) a split-screen video demonstration of shoulder abduction in a normal subject contrasted with a subject with a supraspinatus tear; and (3) a video performance of an exercise commonly used in rehabilitation of a supraspinatus injury, with 3D anatomy superimposed. The user can interactively rotate this model to view the relevant muscles from the anterior, posterior and superior aspect, and muscles can be animated to contract. The anatomy sections were modeled 3-dimensionally and animated using Maxon Cinema 4D, video content was edited and composited in Final Cut Pro HD, and these elements were integrated into a Flash MX interface. Presently this resource is being used in clinical and educational settings; it may provide a template that can be expanded upon to include other injuries and pathologies. This resource is not available for purchase by publishers.

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SKIDD^{1*}, Phil, Jedd ALMOND^{1*}, Meghan LOIACANO^{1*}, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Examining the border and boundaries of the retropharyngeal space. The two principal disease processes, which affect the Retropharyngeal space (RPS), are malignancy and infection. However, there are no reports in the literature providing adequate data for the gross anatomy of RPS, since the majority of the studies are performed with MR and CT. Therefore, we attempted to determine the borders of RPS considering the anatomy of the fascial spaces with gross dissections. We examined 50 formalin fixed cadavers during the years of 2004-2005. The RPS is a potential space that is bordered anteriorly by the visceral fascia and posteriorly by the pre-vertebral fascia. Although this space is commonly referred to as a potential space, there is in fact a very thin fascia (alar fascia) which divides the RPS into anterior and posterior compartments. The anterior compartment, located between the visceral fascia and the alar fascia, is called the RPS 'proper'. A median raphe, in 50% of the cases, is seen separating the RPS into two halves. The posterior compartment, bordered anteriorly by the alar fascia and posteriorly by the prevertebral fascia, is called the "danger space". The RPS 'proper' extends from the skull base to approximately T3/T4 (50%) and T4/T5 (50%), while the danger space extends from the skull base to the diaphragm and provides a direct pathway for head and neck infections to spread into the posterior mediastinum. The contents of the RPS are limited to fat and the retropharyngeal lymph nodes. We measured the RPS soft tissue thickness in relation to the cervical vertebral body diameter. The RPS measured, on average, 0.3 times the anteroposterior diameter of C5. This data could prove useful in evaluating both the metastatic spread of malignancy and the spread of infection within the region.

SMITH, Sean B.*, Stephen W. CARMICHAEL, Wojciech PAWLINA, and Robert J. SPINNER. Mayo Medical School and Department of Anatomy, Mayo Clinic and Mayo Foundation, Rochester, MN. Value of learning Latin and Greek etymologies for anatomic and medical terminology.

Medical students and practitioners learn and use a vocabulary originating almost entirely from Latin and Greek. Previous generations required Latin prior to medical school, but the current generation does not have such requirements. Anecdotal evidence suggests that understanding Latin or Greek helps students to learn

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and practitioners to remember the otherwise foreign terminology. This study evaluated students' familiarity with Latin and Greek etymologies before and after a gross anatomy course that incorporated etymologies into its curriculum, finding that scores on an etymology quiz significantly increased after the course. Students reported that learning etymologies enhanced anatomy learning, made the experience more enjoyable, and was not as difficult as they thought it would be prior to the course. This study also evaluated physicians' familiarity with medical or surgical etymologies. The average score on an etymology quiz was 68.0%, without any significant differences between students, residents, or consultants or between physicians in medical or surgical specialties. All groups equally reported that etymologies enhanced learning terminology, enhanced abilities to recall terminology, and should be incorporated into medical education. This study provides novel scientific evidence that a basic understanding of Latin and Greek etymologies enhances performance and comfort when learning and using medical terminology.

SONPAL*, Niket, Philip DODD*, Jerzy St. GIELECKI*[#], Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. [#]Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). Digital-image analysis of renal artery variations in human fetuses and their clinical significance.

The renal artery is a significant vascular structure in many clinical settings. At the Medical University of Silesia in Katowice, Poland, a study was performed to analyze the development and variations in the renal artery. These investigations were performed through digital image analysis (Angio-Analyzer 2005) on 78 (84 female and 59 male) spontaneously aborted, latex injected, fetuses ranging in age between 14 and 30 weeks; resulting in 143 kidneys (73 left and 76 right) being dissected. Developmentally, the renal arteries diameter, volume and length were measured, and associated with the age of the fetus. Upon statistical analysis (Statistica 6) a significant linear correlation ($p < 0.05$) was observed when associating the age with diameter, volume and length of the artery. Furthermore the largest increase in volume was seen to correlate during the same interval as the largest increase in diameter (22nd-26th week). Many variations were found upon inspection of the fetuses. One anomalous case demonstrated the right kidney to have 3 separate arteries originating from the aorta, while the left kidney only had two. Knowledge of renal artery variations and developmental trends have become

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integral to the success of many renal transplants, post-trauma reconstructions, and many radiological procedures.

SOUTH^{1*}, Gina, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Rare congenital variations in coronary arteries and their significance in sudden cardiac death.

Congenital coronary artery conditions are rare anatomical abnormalities encountered by anatomists, pathologists, interventional cardiologists and thoracic surgeons with an incidence 0.2-1% in the population. We report 10 cases of congenital coronary abnormalities including single right coronary artery (n=4) and single left coronary artery (n=4). In addition we present a case of a single, high take off coronary artery, found in the heart of an 8-year-old male who died suddenly and unexpectedly after a brief period of physical and mental exertion. Furthermore, we present a case of a left anterior descending coronary artery with an anomalous origin from the main pulmonary artery in the heart of 9-year-old female who experienced sudden cardiac death after a syncopal episode. The possible embryonic development of these branching patterns and their clinical significance is discussed. Although these defects have been associated with other congenital anomalies, none were noted in these young children. Clinically, these cases are very important to note as early as possible, however, the symptomatology is very rare. To the best of our knowledge these are extremely rare coronary anomalies that can be the primary cause of sudden cardiac death.

SPARKS*, Jessica L., Jason STAMMEN*, Rod HERRIOTT*, and Ken JONES. The Ohio State University, Injury Biomechanics Research Laboratory, and Vehicle Research Test Center, and Transportation Research Center, East Liberty, OH, and The Ohio State University, Division of Anatomy, Columbus, OH. Technique for evaluating intravascular pressure changes in blunt hepatic trauma.

The liver is one of the most frequently injured abdominal organs in motor vehicle collisions, and blunt hepatic trauma is associated with the highest morbidity and mortality rates of any solid abdominal organ. Previous studies have suggested that in high velocity impacts, rapidly increasing internal fluid pressure may play a role in causing hepatic injury. However, much of the research on the impact response of the liver has focused on the correlation of other physical parameters, such as force, velocity, or compression, with hepatic injury. The objective of this study is to develop and test a methodology for measuring intravascular pressure gradients within

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physiologically pressurized cadaveric liver specimens in response to blunt impact. Experimental methods include the application of fluid-filled catheters as intravascular pressure-measuring devices and the development of a transfer function to correct distortion of pressure waveforms from fluid-filled catheter pressure-measuring systems. Regression analysis of four model tests indicates good correlation between corrected catheter-based pressure measurements and actual local pressures at the internal catheter opening ($r^2 = .90$ to $.95$, $p < .05$). Future work will utilize this technique to investigate increases in intravascular pressure as a potential mechanism of injury in blunt hepatic trauma. (Sponsored by Contract No. DTNH22-03-D-08000 from the National Highway Traffic Safety Administration)

SPARR*, Jennifer, Ralph GER, Sherry A. DOWNIE, Todd R. OLSON. Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. A new perspective on the traditional saphenous vein cut-down.

The great saphenous vein (GSV) over the distal tibia is a preferred vessel and site for vascular access. The GSV has proven to be an ideal vessel because of its size and consistency. The site is advantageous primarily because the GSV is subcutaneous. Also, at the distal end of the limb, the site is convenient for use in the emergency room. However, the traditional horizontal cut-down incision used at this site is problematic for postoperative healing and wound closure. Anatomical and clinical objections to traditional site and procedure: 1. The arterial supply of the skin over the distal tibia is poor. Identifiable large arteries are few and a transverse incision severs the small essential neurovascular structures running longitudinally to supply and drain this area. 2. The traditional procedure of incising over the entire malleolus (3-5 cm) to locate the vein results in an unnecessarily large incision and often leads to an undesirable amount of dissection especially when varicosities are present, the patient is obese, or the leg is edematous. In these cases, subcutaneous fat necrosis is common and healing is prolonged. The clinical relevance of these points is confirmed by the fact that this area is well known to those who run wound clinics as a very common site of cutaneous ulcers that resist healing. Proposed alternative site and procedure for saphenous vein cut-down: A study of over 80 cadavers suggests that a better site is the depression between the terminal part of the tibialis anterior muscle tendon and the anterior border of the medial malleolus. We have termed this site the talomalleolar depression because of its relation to the talus and malleolus. We propose use of this site because: (1) the site is easily

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palpable in almost all patients, (2) the GSV is prominent and constantly present, (3) there is good cutaneous circulation, and (4) a vertical rather than horizontal incision can be used. The use of a *vertical* incision should result in both reliable and easy exposure to the vein through a smaller incision and should reduce unnecessary tissue damage thus facilitating healing. Most importantly for wound healing, the skin in the talomalleolar depression has better circulation than that overlying the malleolus. Consequently, use of this site and procedure should significantly improve postoperative outcomes and reduce complications especially in problematic patients. The findings presented here underscore the value of cadaveric dissection in anatomical education and clinical research.

SPINNER, Robert J., A. Lee DELLON*, Gedge D. ROSSON*, and Kimberly K. AMRAMI* Departments of Neurologic Surgery and Radiology, Mayo Clinic and Foundation, Rochester, MN and Dellon Institute for Periphiheral Nerve Surgery, Baltimore, MD. Tibial intraneural ganglia in the tarsal tunnel: is there a joint connection?

Intraneural ganglia are rare and their pathogenesis has been extremely controversial. Recent evidence from intraneural ganglia occurring at the most common site (the fibular nerve at the fibular neck) has suggested an articular origin rather than de novo formation. Fewer than ten examples of tibial intraneural ganglia within the tarsal tunnel have been reported, only one of which had a joint connection. To test the hypothesis that these intraneural ganglia arise from neighboring joints, we analyzed four patients retrospectively, all of whom had MR imaging and operative intervention. Two of these patients were treated by us. The other two patients were the only ones previously published that had MR images available for reinterpretation. In none of these cases was a joint communication appreciated by radiologists interpreting the MR images preoperatively or by surgeons intraoperatively. Our review of these same cases demonstrated radiographic evidence of joint communication in all cases: the tibiotalar joint (1) and the subtalar joint (3). The two new patients developed intraneural cyst recurrence (their articular connection was not addressed). We believe that tibial intraneural ganglia within the tarsal tunnel originate from neighboring joints and connect through articular branches. The importance of these connections is two-fold: for their role in the pathogenesis of this entity and their potential therapeutic implications. Recognizing that there is a joint connection hopefully will translate into optimized surgical interventions and improved outcomes.

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SPINNER, Robert J., Phillip K. EDWARDS*, Kimberly K. AMRAMI*. Departments of Neurologic Surgery, Orthopedics, Biomedical Engineering and Radiology, Mayo Clinic, Rochester, MN. The application of three-dimensional rendering to joint-related ganglia. The origin of periarticular cysts is poorly understood and controversial. Simple (extraneural) cysts are presumed to be derived from joints, although joint connections are not always established. More complex cysts such as intraneural ganglia are thought by many to form within nerves de novo (degenerative theory). We believe that intraneural ganglia are joint-related (articular theory). Joint connections are often not readily appreciated with routine imaging or at surgery. Not identifying and/or treating joint connections frequently leads to cyst recurrence. More sophisticated imaging may enhance visualization of these joint connections. We created a 3D rendering technique to assess potential joint connections of simple and complex cysts (fibular intraneural ganglia) localized to the proximal lateral leg region. 2D and 3D data sets from MRI were segmented automatically by signal intensity with further refinement based on interaction with the user to identify specific anatomic structures such as small nerves and vessels on serial images. The bone, cysts, nerves and vessels were each assigned different color representations and 3D renderings were created in ANALYZE using the data sets closest to isotropic resolution as the primary background rendering. In all of these cases, we demonstrated joint connections to the superior tibiofibular joint. Surgery addressing the cyst, the connection and the superior tibiofibular joint resulted in excellent outcomes; postoperative MRI's did not demonstrate recurrence. This 3D technique allows visualization of occult connections not readily appreciated with standard MR imaging. We believe that these joint-related cysts have a common pathogenesis; they dissect through a capsular rent and follow a path of least resistance either extraneurally or intraneurally (along the articular branch). Understanding the pathogenesis for cyst formation will improve surgical management and outcomes. We have adapted this 3D technique to enhance the visualization of cysts occurring at other joints.

STEFAN, Cristian. Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA. Incorporating a "Waiting Room" component into human anatomy lectures facilitates the transition between basic science knowledge and clinical applications.

Most clinical correlations in basic sciences have been traditionally

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presented as separate sessions, following the discussion of basic science concepts. The present pilot study evaluates how first-year medical students responded to a more integrative and interactive approach which incorporated appropriate clinical examples and scenarios directly into anatomy lectures. Two screens were preferably used during each lecture. Material related to basic science aspects of anatomy was projected on the first screen. Educational material which highlighted clinical applications of key concepts was projected on the second screen, entitled "The Waiting Room". This format offered the opportunity for problem-solving exercises in class and for a smoother transition between knowledge and ability to apply knowledge to practical situations. 51% of students who answered a questionnaire found this format very useful or useful and another 21% somehow useful. According to the results of the same questionnaire, students indicated that this format helped them to better realize the practical importance of theoretical concepts (58%); increase their general interest in the matter (51%); integrate the accumulated knowledge (49%); recall better what it was discussed in class (23%); become a more active participant in the lecture (19%); and follow easier the presentation in class (12%).

STEFAN, Cristian, Ancuta M. Stefan*, and Stephen Baker*. Department of Cell Biology, University of Massachusetts Medical School, Worcester, MA. Accuracy of students' estimate of their histology individual scores in answering multiple choice questions is correlated with the actual grades.

First-year medical students were asked to estimate the number of multiple choice questions (MCQ) they answered correctly in the written portion of the first two block exams of our Histology course. The results showed a significant linear relationship between the actual scores and the difference between the students' estimated and actual individual scores. The strength of relationship was moderate (-0.40 for the first and -0.44 for the second exam) but statistically significant ($p < 0.001$). The analysis found no difference in the slopes of the two exams, which resembled parallel lines although the intercepts were different. The combined estimate of the common slope was -0.42 (+/- 0.066). Analysis of the mean square error indicated that the second exam was characterized by less variability from the fitted line compared to the first exam. The self-estimate scores were closest to the actual ones in the region of mid to high-eighties. The methodology used in this pilot study offered opportunities for: (a) additional self-assessment for students; (b) increased self-awareness; (c) surfacing potential strengths and

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weaknesses in order to provide more focused and personalized academic assistance where needed; and (d) a better understanding regarding the general response to MCQ based exams.

STEWART, Fiona. Department of Anatomy and Histology, University of Sydney, NEW SOUTH WALES. Iatrogenic deaths related to anatomical ignorance in surgical application and the re-introduction of whole body cadaveric dissection for surgical trainees in Australia.

Over the past 35 years medical schools in Australia, Britain and the United States of America, abolished teaching of gross topographical regional anatomy by complete cadaver dissection, supported by lectures, small group intensive tutorials and the procedure-oriented cadaveric applied anatomy, with surface anatomy, required of hospital resident medical officers, which was taught by senior and trainee surgeons. Today, medical school teaching is predominantly problem-based, its "anatomy requirement" delivered as "system overview", via computer-accessed "web sites" with, or without, prosected specimen support. At BACA, Leeds, 1999, Royal Australasian College of Surgeons' (RACS) fellowship examiner and consulting surgeon, A.J. Buzzard, observed: "in Australia there is an exponential escalation in malpractice litigation", "in part of (*due to*) an inadequate anatomical knowledge." "perhaps Australian medical schools will also be joined in the action. Inadequate anatomy teaching could provide a fertile legal field." A rise in iatrogenic procedure-related morbidity and mortality related to hospital procedures, performed by resident medical officers, of 2nd year trainee level and beyond, is recognized by Australian surgeons and pathologists. Post mortem pathology from routine in-patient resident medical officer (RMO)-executed procedures is presented. These deaths, the result of RMO's anatomical ignorance and/or inadequate supervised procedural training preparatory to procedure-performance. Whole body dissection, with application, for surgical trainees commenced, in Sydney, in 2000.

STUART^{1*}, Lynsey, Robert G. LOUIS Jr.^{1*}, Quentin A. FOGG¹ and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. An anatomical study of the ilioinguinal nerve, a detailed examination of a complicated structure.

In considering the differential diagnosis of groin pain a physician must include the ilioinguinal nerve as it may become injured during hernia surgery or lower quadrant surgical procedures. To treat injury

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to this nerve, it is critical to understand its anatomic variability. The aim of this study therefore, was to examine the anatomic variability of the lumbar plexus, specifically the ilioinguinal nerve. We have examined 300 formalin fixed cadavers during the years of 2000-2005. The Ilioinguinal nerve was present in 92% of the cases. It originated from the lumbar plexus independently in 70% of cases, together with the iliohypogastric nerve in 23% and was absent in 8% of the cases. 10 types of origin of the ilioinguinal nerve were distinguished depending on its origin from the lumbar plexus. The ilioinguinal nerve was formed by one root in 90% of cases (I,II,III,IV,V,V,VIII,IX) and by two roots in 10% (III,VII,X). In 80% of cases, the ilioinguinal nerve arose from one spinal root (primarily L1 rarely L2) and in 15% of cases from two spinal roots (T12-L1, L1-L2, L2-L3). Uniradicular nerves arose by the union of the ventral branches of nerves T12-L1 (I, II) and L1-L2 (VIII, IX). In biradicular nerves, the upper root arose from ventral branches of T12 (III), L1 (VII), or L2 (X) and the lower root from L1 (III), L2 (VII), or L3 (X). The great variability of the ilioinguinal nerve may prove a complicating factor during diagnosis of pain in the inguinal region.

SULEMAN*, Shazeen, Pirooska 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. Articularis cubiti: morphology and muscle architecture.

Triceps brachii has a bony attachment to the olecranon and a capsular attachment from the deep fibres of the medial head to the elbow joint. The morphology of the capsular attachment, articularis cubiti (AC), has not been documented. It has been suggested that the AC retracts the capsule of the elbow joint during forearm extension, preventing the capsule from being impinged (Williams et. al, 1989). The purpose of this study is to examine the morphology and muscle architecture of the AC. The AC of 25 formalin embalmed cadaveric specimens were dissected (elbow in 90 of flexion) and digitized. The triceps tendon was cut at the olecranon, and reflected proximally to separate the AC from the medial head of triceps brachii. Fibre bundles were traced to their attachment on the capsule of the elbow joint. The AC is triangular in shape, with the apex attaching to the posterior surface of the distal humerus. The fibre bundles are arranged in parallel and are approximately the same length throughout the muscle (4.71 ± 1.36 cm). Clinically, the AC may affect the functional outcome following triceps brachii tendon avulsion.

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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. Capsular fibres of brachialis: an anatomical study.

Brachialis has been described as having a bony attachment to the ulna and a capsular attachment to the elbow joint (Von Lanz et al., 1959). The capsular attachment was referred to as the articularis cubiti, the same name as given to the deep portion of triceps brachii. The purpose is to identify and quantify the capsular attachment of brachialis (BC). BC was identified, dissected and digitized (elbow in full extension) in 25 formalin embalmed cadaveric specimens. In all specimens the BC was separated from the brachialis by cutting and reflecting proximally the part attaching to the ulna. Fiber bundles of BC were traced to their attachment to the capsule of the elbow joint. The BC has an inverted 'i' shaped attachment to the distal humerus. The fibre bundles are longest centrally (7.27 ± 1.43 cm) and shorter medially (5.72 ± 1.36 cm), and laterally (6.09 ± 1.49 cm). The BC may function normally (like the articular muscle of the knee) by preventing the interposition of capsular folds between the articulating bones. Clinically, pathology of the BC (e.g. adhesions, calcifications) may contribute to pain of the elbow joint.

SZCZECHLA* Marek, Martyna POLAK*, Nirali PATEL* Niket SONPAL*, Jerzy St. GIELECKI**#, Anna ZURADA*, and Grzegorz GAJDA*. Department of Anatomy, Medical University of Silesia, Katowice, POLAND. #Department of Anatomical Sciences, Medical School, The University of Adelaide, AUSTRALIA. (sponsored by S. W. Carmichael). Digital-image analysis of the medial cord of the brachial plexus in human fetuses.

The brachial plexus supplies neuronal control to a great deal of the upper extremity and thorax. At the Medical University of Silesia in Katowice, Poland a study of the medial cord and inferior trunk was analyzed through digital images (Nerve-Analyzer 2005). The analysis was performed on 28 (14 female, 14 male), spontaneously aborted fetuses ranging in age between 15-30 weeks; thus yielding 46 (20 right & 26 left side) plexuses. The segments of the medial cord that were examined specifically were the medial contributing root of the median nerve, root of C8 and Th1, medial trunk, and the inferior trunk. Upon statistical analysis (Statistica 6), a significant correlation was found between the age, length and diameter of each aspect analyzed. The relationship was graphically linear and was shown to have the largest growth during the weeks that associate

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with the second trimester.

TASER Figen*, Nabil A. EBRAHEIM*, Qaiser SHAFIQ*, Carlos A.C. BAPTISTA . Medical College of Ohio, Department of Orthopaedics, and Neurosciences, Toledo OH. Quantitative anatomical and radiographic analysis of lateral ankle ligaments.

Ankle sprains are common injuries frequently associated with tears of major supporting ligaments. This study was designed to determine and describe precise anatomy of the lateral ankle ligaments and also to provide anatomical correlation between gross anatomical and radiographic images. Forty two embalmed cadaver legs were carefully dissected to see all ligaments. Lateral ankle ligaments insertion points were determined and described in detail, then, dimensions and angular measurements of these ligaments were taken and their size and mutual relationships were recorded. Before standard radiographs were taken, the ligaments were coated with radio-opaque material (lead oxide). Constructional and angular relationships of lateral ankle ligaments to the bony structures of radiographes were compared with the gross anatomical observations and measurements. Statistical analysis was performed using SPSS 11.0 software. Mean and standard deviation values of measurements were calculated. The anterior talofibular ligament (ATFL) is a flat quadrilateral ligament with mean 21.68mm length and 10.45mm width, courses from the anterior margin of the lateral malleolus to a talar attachment with 25° angle with horizontal plane. The calcaneofibular ligament (CFL) arises from the deep aspect of the lateral malleolus and courses downward and backward to its attachment to the lateral aspect of the calcaneus. CFL is longer (mean length 33.20mm) and narrower (mean width 8.70mm) than ATFL while the angle between these ligaments is 132°. Knowledge of the location and extent of the normally non-opaque major supportive ligaments of the ankle, and their relationships to the osseous structures allows an understanding of the radiographic appearance of the acute ligamentous injuries and facilitates interpretation of plain films. This data is important also in the design and planning of surgical procedures to repair or reconstruct these ligaments.

TASER Figen*, Nabil A. EBRAHEIM*, Qaiser SHAFIQ*, Richard A.YEASTING*. Medical College of Ohio, Department of Orthopaedics, and Anatomy, Toledo OH. (sponsored by Carlos A.C. Baptista). Enlarged perforating branch of peroneal artery and extra crural fascia in close relationship with the tibiofibular syndesmosis.

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Current study represents an anomaly of the perforating branch of peroneal artery (PBPA), vein and the extra crural fascia which covered anomalously enlarged vessels. We found extremely large PBPA in an 89-year-old female cadaver's left ankle. The anterior tibial artery could not reach to supply ankle and dorsum of the foot. PBPA continued as dorsalis pedis after giving anterior lateral malleolar artery branch. Posterior tibial artery was very thin than usual. On anterior side of the ankle, there was an extra crural fascia in addition to the regular crural fascia, under the anterior crural muscles. This strong fascia was tightly overlying the perforating branch of peroneal artery and anterior tibiofibular ligament. The extra crural fascia that covers the anomalous vessels is a very rare variation. In cases of tibiofibular diastasis, the thick extra crural fascia overlying the anterior tibiofibular ligament may lead to false impression of intact tibiofibular syndesmosis. The anomalously enlarged PBPA is although uncommon yet surgically important variation. The surgeons must be careful while dissecting in this area that PBPA may be enlarged and crossing in front of the tibiofibular syndesmosis to prevent vascular injury.

TASER, Figen*, Nabil A. EBRAHEIM*, Lee WOLDENBERG*, Richard A.YEASTING*, Carlos A.C. BAPTISTA. Medical College of Ohio, Department of Orthopaedics, Radiology, Anatomy and Neurosciences, Toledo OH. Three-dimensional volume rendering of spiral CT data of the tibiofibular syndesmotoc diastasis.

An intact syndesmosis is important in maintaining normal ankle function. Tibiofibular syndesmotoc diastasis without associated fibular fracture has been known and is easily overlooked. Syndesmotoc injury may be difficult to understand by radiographic criteria. The present study was undertaken to define the anatomic characteristics of the tibiofibular syndesmosis joint space on spiral CT scan by three-dimensional (3D) volume rendering and extrapolate cadaveric data to explain possible clinical significance of syndesmotoc diastasis. Forty-two cadaveric specimens of the ankle were used. Simulation of tibiofibular diastasis was performed by external fixator and CT scan was taken following each 1 mm diastasis. 3D images of all specimens were rendered and their volumes were computed using Auto-CAD 2005 software. All 1 to 3 mm diastases could be visualized on CT scans and, recognized by calculating volume of joint space. 3D volume rendering of spiral CT data has been found very sensitive method. Volume calculation using this method can be performed in cases of syndesmotoc instability after ankle injuries and

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for preoperative or postoperative evaluation of the integrity of the tibiofibular syndesmosis.

TASSONE Peter*, and James M. F. CLARKE* #. Departments of Otolaryngology and Vascular Surgery#, Norfolk and Norwich Hospital, Norwich, UK. (sponsored by D. J. Heylings). Tracheo-innominate artery fistula. A case report with a review of the management and description of anatomical risk factors for its development.

We report a case of a 36 year old female who presented with haemorrhage from a tracheostomy tube. The tube had been present for 1 year following tracheal resection for a stenosed segment. After a median sternotomy and right lateral neck incision, the innominate artery was identified and isolated between clamps. A tracheo-arterial fistula was found. The fistula was oversewn and a Dacron graft sutured in place. A sternocleidomastoid muscle flap was raised and used to close the tracheal defect. The patient never regained consciousness and she sadly died 4 days post-surgery from an embolic stroke. Tracheo-innominate artery fistula is a well-documented complication following tracheostomy with an incidence approximately 0.5%. The artery crosses anterior to the trachea usually at the level of the 9th tracheal ring though this can be variable. Previous surgery to the trachea may have resulted in an inadvertently high innominate artery therefore more susceptible to fistula formation by the tube. We describe other potential anatomical risk factors in general for fistula development with reference to the embryology of the artery and anatomy of the area. Awareness of these risk factors may help clinicians identify patients more likely to develop this rare but potentially fatal complication.

TONGSON, Jonathan^{1*}, Artur BARTCZAK^{3*}, Martin FUNDALEJ^{4*} and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA., ³Department of Pathology, Institute of Rheumatology, Warsaw, Poland, ³Department of Forensic Service, Warsaw, Medical University, Warsaw, POLAND The clinical anatomy of the papillary muscle of the conus.

Many authors have questioned the gross anatomy of the papillary muscle of the conus (PMC) during the past century. An anatomical investigation was conducted to identify the borders of PMC and its exact topography. Our study involved 200 formalin fixed adult human hearts ranging from 22 to 78 years of age. A digital imaging analysis system was applied to observe the exact location of the PMC. The

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location of the PMC was found to be, when viewed from the right ventricular inflow tract, 3-5 mm below the junction of the septal and anterior leaflets of the tricuspid valve in all 100 specimens. When viewed from right ventricular outflow tract, the PMC was located in 146 (73%) specimens at the junction between the subpulmonary infundibulum and the septal band, and in 54 (27%) specimens it was located at the area occupied by the superior border of the septal band. The present study describes the topography of the PMC according to its surrounding anatomical structures such as the tricuspid valve, subpulmonary infundibulum and septal band of the right ventricle. This anatomical data could have important clinical significance for cardiac surgeons operating in this area.

TU, Khin, M.; Gerald R. CONOVER and Patrick C. HARDIGAN*. College of Medical Sciences, Nova Southeastern University, Ft. Lauderdale FL. Changing trends in the teaching of anatomy.

Research consistently has shown that traditional lecture methods, in which professors talk and students listen, dominate college and university classrooms. Within this context, it is proposed that strategies promoting active learning be defined as instructional activities involving students in doing things and thinking about what they are doing. Use of these techniques in the classroom is vital because of their powerful impact upon students' learning. For example, several studies have shown that students prefer strategies promoting active learning to traditional lectures. Other research studies evaluating students' achievement have demonstrated that many strategies promoting active learning are comparable to lectures in promoting the mastery of content but superior to lectures in promoting the development of students' skills in thinking and writing. This research creates the need for us to look at other educational methodologies to establish a solid foundation in the basic sciences that is integrated into other aspects of medical school curriculum such as systems course. This study proposes that we compare traditional methods of teaching anatomy against an active learning process grounded in the functional integration of basic science and clinical disciplines. The traditional method of teaching anatomy, comprised of 104 hours of lecture and 57 hours of lab of dissection, will be compared against a new approach, comprised of 68 hours of lecture and 52 hours of prosection.

TU*, Khin, M., Gerald R. CONOVER*, Donna C. HERMEY, Jonathan K. KALMEY and Patrick C. HARDIGAN*. College of Medical

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Sciences, Nova Southeastern University, Ft. Lauderdale, FL. The role of cadavers in problem based learning.

Anatomy possesses many variations of normal patterns and structures that are not necessarily pathological; knowledge of the possible normal variations is therefore important for a well-trained physician. To this end, a new anatomy course that focuses on the integration between the basic science of anatomy and its clinical correlations is planned. Under this new course the instructor will provide a case based scenario for a firm grounding in anatomical sciences including surgical anatomy, clinical anatomy, applied anatomy, and functional anatomy. Clinical findings will also be presented to the students. It is believed this new course will change the students' attitude toward learning and arouse their interest in the study of anatomy by gradually introducing disease processes. This will also enrich students' anatomy experience by correlating anatomical results with clinically relevant findings. Most importantly, this endeavor will allow the students to learn gross anatomy integrated with diseases, anatomical variations, and developmental conditions that they will encounter in their clinical careers. Students will be exposed to these findings during laboratory time and lecture time, and they will be encouraged to study the catalog of pathological findings on their own time. This presentation will provide a discussion of the quantitative and qualitative outcomes of the new course.

TUBBS, R. Shane, E. George SALTER, and W. Jerry OAKES*. Department of Cell Biology and Division of Pediatric Neurosurgery, University of Alabama at Birmingham, AL. The tabatière anatomique. There is scant detailed information regarding the tabatière anatomique (anatomical snuff box) in the literature. The authors dissected this area in 15 adult cadavers (30 sides) and made measurements and observations of this region. We found that the average mean width and length of this geometric area was 4 cm and 6 cm respectively. Although the dimensions of the tabatière anatomique tended to be larger among male specimens this trend did not reach statistical significance ($p > 0.05$). There was no statistical difference between left and right sides. The majority (70%) of specimens was noted to have connections between the cephalic vein and the vena comitantes of the radial artery within the tabatière anatomique. Five specimens were noted to have a muscular branch to the abductor pollicis brevis muscle arising from the dorsalis pollicis artery in the tabatière anatomique. The dorsalis pollicis artery was found to originate in the tabatière anatomique in all specimens. One

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right-sided specimen was noted to have an intraosseous branch of the radial artery that entered the styloid process of the radius. A well-formed collection of fat was noted between the styloid process and base of the first metacarpal in all specimens. This fat pad completely covered the radial artery in the majority of specimens and had loose connections to both the first and second dorsal compartments. The branches of the superficial branch of the radial nerve always originated distal to the tendon of the extensor pollicis brevis muscle. These data may prove useful to the surgeon or clinician who operates or examines this interesting anatomical area.

TUCKER^{1*}, J.J, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}.
¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA.
Communication patterns between the Spinal Accessory nerve and the cervical plexus.

Detailed knowledge of the anatomy and course of the spinal accessory nerve (SAN), which innervates the sternocleidomastoid and trapezius muscles, is necessary during procedures in the neck and shoulder region. This is so as to avoid iatrogenic nerve injury and aid the dissection in cases where the spinal accessory nerve is used as a donor nerve. The aim of this study therefore, was to investigate the connections between the cervical plexus and the SAN. We examined 50 formalin fixed cadavers during 2004 and 2005 at the American University of the Caribbean School of Medicine. There was great variability in the connections between the SAN and the roots of the cervical plexus. Connections existed in 90% of the specimens and were always situated under the sternocleidomastoid. The connections were divided in to simple and combined. Simple connections, involving only one root of the cervical plexus were observed in 40% of the dissections whereas connections between the SAN and more than one root were present in 60% of the dissections. In simple connections, 35% involved C2, 55%, C3 and 10%, C4. In combined cases, the C2 and C3 roots were interconnected in 65% of specimens while C2, C3 and C4 were interconnected in 25% of specimens. In the remaining 10% of cases, individual branches from the cervical plexus were connected to the trapezius muscle and not to the sternocleidomastoid or SAN. The mixed nature of the cervical plexus fibers, the limited number of direct branches to the trapezius and the location of the cervical plexus-SAN connections, indicate that the cervical plexus will hardly innervate the trapezius after SAN division.

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VALAND Sanjay*¹, Sachi SIVANANTHAN¹, Fenella KIRKHAM².
¹Guy's, King's & St Thomas' School of Medicine, Kings College London, UK. ²Paediatric Neurology, Neurosciences Unit, Institute of Child Health, London, UK. Imaging vessel vulnerability – how CT, MRI and ultrasound aid the anatomical assessment of hypoxic ischaemic encephalopathy.

Hypoxic Ischaemic Encephalopathy (HIE) affects 0.3-1.8% full-term infants. We aimed to assess and demarcate areas of the brain that are most commonly affected by sub-types of HIE: periventricular leukomalacia and watershed infarcts. The typical symptoms are attributed to the anatomical areas identified. Vulnerability of the anterior, middle and posterior cerebral arteries were assessed. These variables were compared through MRI and ultrasound from established studies to assess their detail, reliability, ease of use and role in management of HIE. We found that by using data from 150 cases we are able to illustrate cerebral ischaemic damage through the use of CT scans at different stages of progression and establish correlations with the MRI and ultrasound studies. MRI already provides a high level of anatomical detail for all types of HIE, except status marmoratus for which ultrasound is better suited. The middle cerebral and pericallosal arteries identified, are more vulnerable in HIE. Doppler ultrasound studies on middle cerebral artery patency show a marked decrease in flow velocity in the watershed infarcts. We can demonstrate that CT is more universal and has a clinical role in identification of the affected periventricular areas, pre-central gyrus and basal ganglia, which give rise to dyskinesia and seizures.

VAN DER WALL^{1*}, Brad, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Iliolumbar membrane, a newly recognized structure in the back.

We describe a new membranous fascial anatomical entity, which we have decided to name the Iliolumbar Membrane (ILM). We dissected 40 human cadavers fixed in formalin during 2004-2005, at the American University of the Caribbean, School of Medicine. The ILM is a thick connective tissue structure deep to the skin, originating from the fibers of thoracolumbar fascia at the lateral border of the erector spinae. It runs inferior to the superior border of the iliac crest lateral to the posterior superior iliac spine, overlying the iliac crest at the level of the fourth lumbar vertebra. The ILM terminates within subcutaneous fat where it divides in multiple layers. All the cadavers showed a considerable variation concerning the blending of the membrane's multiple layers with the subcutaneous fat. However, all

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specimens were consistent with the uniform appearance of the ILM at the point of its origin. The ILM could be demonstrated objectively by ultrasound examination with a high frequency of 7.5MHz. A hypothesis is put forth, conjecturing that this new structure may have relevance in creating a natural barrier between the musculature of the back and the muscles of the gluteal region.

VILENSKY, Joel A., Sid GILMAN* and Christopher GOETZ*. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Fort Wayne, IN, Department of Neurology, University of Michigan School of Medicine, Ann Arbor, MI, and Department of Neurological Sciences, Rush Presbyterian – St. Luke's Medical Center, Chicago, IL. Motion picture images of movement disorders involving the head and neck in postencephalitic parkinsonism.

PEP was often characterized by movement disorders involving particularly the head and neck. These included a variety of hyperkinesias as well as signs of hypokinesia. As part of an effort to compile a comprehensive motion picture record of PEP, we have collected, archived and organized a large sample of PEP examples and here focus on head and neck movement disorders. The documented movements include oculogyric crises, blepharospasm, paroxysmal yawning, side to side and to and fro jaw tremors, facial akinesia and facial tremors, torticollis and compulsive mouth and tongue movements, several often occurring within a single patient. The variable phenotype of PEP suggests involvement of many aspects of basal ganglia circuitry and although specific clinicopathological correlates are not available for these cases, these examples attest to the distinctive combinations of neurological signs that distinguished the sequelae of this historic epidemic.

WARTMANN^{1*}, Christopher, Robert G. LOUIS Jr.^{1*,**} and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Cysterna chyli, a detailed anatomical look.

Operations on the thoracic duct (TD) are indicated by primary conditions, such as trauma, iatrogenic injury, tumors and functional incontinence and by secondary involvement in neoplastic occlusion, portal hypertension, biliary atresia and acute pancreatitis. However, the anatomy described in the literature for the cisterna chyli (CC), as well as in standard anatomy textbooks remains obscure and often incorrect; specifically, the number of CC, the points of origin, the branches, and the location of the CC with respect to the vertebral column. The aim of the study therefore, was to contribute to the

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development of valuable anatomical knowledge for the intra-operative access of TD and CC. Three hundred formalin fixed cadavers were examined during the period of 2003-2005. The CC was absent in 30% of the specimens examined. The CC was variably located at L1-L2 (63%), T12-L1 (21%), at T11-12 (8%) at T11-T10 (5%) and T9-T10 (3%). The average length of the TD was 4.2cm with a range of 1.4-7.5cm. Furthermore, we classified the origin of the drainage patterns for the formation of the CC. Type I (45%) single CC formed by the union of the left lumbar trunks (LT), and the intestinal trunk (IT). The combined trunk joined the right lumbar trunk (RT) in variable manner (4 subtypes). Type II (30%) the CC did not contain the IT (opened into the TD) and the RT, LT, retroaortic nodes (RN) and branches from intercostals lymphatics (IL) joined in variable manner (4 subtypes). Type III (20%) the CC form by the junction of RT and IT. The rest 5% (Type IV unclassified) of the specimens exhibited different patterns that could not be categorized. This anatomical data could have important clinical significance for the identification of the CC with CT and MR imaging.

WELCK*, Matthew, J., JONES, Gareth G., ELLIS, Harold. Guy's King's and St Thomas's School of Biomedical Sciences, King's College, London, UK. The difficulties facing anatomical and medical research involving cadavers in the U.K.

Approximately one thousand adults generously donate their bodies for cadaveric dissection annually in the U.K. Their use for anatomical teaching and medical/anatomical research is in our opinion invaluable. The Anatomy act (1984) and Anatomy Regulations Act (1988) contain comprehensive regulations that are overseen by Her Majesty's Inspector of Anatomy. This paper begins with a case report and discussion (including photographs) of an unusually distinct jejuno-ileal junction observed in the dissection room. Unfortunately, full investigation of the medical and anatomical importance of this observation was not possible due to constraints imposed by the Anatomy Act. The specific constraints relevant to this case are used as a platform for a more wide-ranging discussion regarding the current difficulties facing anatomical and medical research involving cadavers in the UK. The strict regulations of this act are also contrasted with the regulations of the Human Tissue Act (1961), which concerns the removal and use of organs and tissue for therapeutic, educational or research use. We hope this will be of particular interest at the joint meeting of the AACA and BACA as it

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may fuel an interesting comparative discussion. Hopefully this may provide useful ideas for the evolution of current law in both countries.

WESTBROOK^{1*}, Lisa, Rhanjil SHAH^{1*}, Quentin A. FOGG¹, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Examining the functional significance of the facial ligaments, septae and adhesions

Detailed knowledge of the anatomy of the ligaments of the face, which support the facial soft tissues both in normal anatomic positions, and resisting gravitational changes, is necessary during facial plastic and reconstructive procedures. The aim of this study therefore, was to investigate the location of these ligament as well as any possible variations. We examined 50 formalin fixed cadavers during 2004 and 2005 at the American University of the Caribbean School of Medicine. We were able to identify the following true ligaments in 85% of our specimens: Zygomatic ligament, Periauricular Parotid ligament, Parotidomasseteric Ligament, Platysma ligament, Mandibular ligament and Temporal ligament. A great variety of septa and adhesions were evident in all of our specimens, particularly in close proximity to the above mentioned ligaments. However, all true ligaments appeared to be relative constant in their location, while they exhibit a great variability into their width and length. We found a linear relationship between the thickness of the true ligaments and the number of the septae around the true ligament. This data are in an agreement with the recent notion that septa and adhesions function as retaining ligaments, even though they are not classified as true ligaments. Hence, it is becoming of great importance to map the major areas of septa and adhesion location in order to avoid difficulties in facial rejuvenation procedures.

WHITE^{1*}, Dorothy, and Marios LOUKAS^{1,2}. ¹American University of the Caribbean, Sint Maarten, NETHERLANDS ANTILLES; ²Harvard Medical School, Boston, MA. Re-examining the anatomy of the Sacrotuberous ligament and its importance in pudendal nerve entrapment.

With the hope of filling gaps in the anatomical and clinical literature, this study was undertaken to reappraise the gross anatomy of the sacrotuberous ligament (STL), with the objective of providing an accurate anatomical basis for clinical conditions involving the STL. We studied the gross anatomy of the STL in 50 formalin fixed cadavers (100 sides) during the period of 2004-2005. All specimens

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exhibited an STL with a ligamentous part and, in addition, 87% of specimens exhibited a membranous (falciform) portion, which extended towards the ischioanal fossa. The variations of the falciform extensions were classified into 2 types. In type I (69%) the falciform process extended towards and continued along the ischial ramus to terminate at the obturator fascia. In Type II (18%) the falciform process extended along the ischial ramus to fuse with the obturator fascia and continued to the ischioanal fossa. In addition, in type II, the medial border of the falciform process descended to further fuse with the lateral anococcygeal ligament, forming a continuous membrane. Furthermore, the medial border of the internal surface of the proximal part of the STL fused with fibers of the ventral sacrococcygeal ligament in 50% of type II specimens, forming a smooth continuous surface between the ligaments. This data could have important implications in the understanding of pudendal nerve entrapment syndrome.

WIJERATNA*, Malin D., Nicholas R. EVANS* and John OLDER. Department of Anatomy, School of Biomedical Sciences, Kings College, London, UK. The anatomical importance of the tibial nerve and its branches in facilitating endoscopic approach to the tarsal tunnel.

Few attempts have been made to endoscopically decompress the tarsal tunnel in tarsal tunnel syndrome. One of the limitations of this blind technique is the danger of damage to the tibial nerve and its branches. We investigated the branching of the tibial nerve into its plantar and calcaneal divisions in 50 cadaveric legs (25 left, 25 right; age range = 51-100 years), and compared their relationship to three surface landmarks; the medial malleolus (MM), the navicular tuberosity (NT) and the calcaneal tendon insertion (CT). We found the plantar division localised to on or below the MM-CT line, anterior to a perpendicular line bisecting its midpoint, in 82% of specimens, and on or above the NT-CT line, posterior to a perpendicular line bisecting its midpoint, in 82% of specimens. The calcaneal division was localised to the same areas in 72% and 86% of specimens respectively, creating a quadrangular area to be avoided. A detailed knowledge of the plantar and calcaneal divisions in relation to palpable anatomical landmarks should reduce the risk of neuropraxia in endoscopic tarsal tunnel decompression.

WINESKI, Lawrence E., Perry RIGGINS*, and Rebecca A. SEALAND*. Department of Anatomy & Neurobiology, and Division of Information Technology Services, Morehouse School of Medicine,

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Atlanta, GA. Replacing lecture with an interactive computerized study guide improves student attitudes and performance in gross anatomy.

At the Morehouse School of Medicine, human gross anatomy, embryology, and histology are integrated in a single course ("Human Morphology"). In this, we aim to reduce the time spent in passive learning in classroom lectures, provide anytime/anyplace learning flexibility, and emphasize active learning in labs. One step in achieving our aims was to produce an interactive CD-ROM study guide ("T.I.P.S.: Temporal, Infratemporal, Pterygopalatine Study Guide") to replace the traditional lecture on these challenging regions. Four years use of TIPS has shown notable changes in student attitudes and performance. Student response has been overwhelmingly positive. They particularly like the independence this format provides, and feel the CD allows more effective use of their time and enhances their learning of this material. Student opinions have evolved to favoring using the CD as a replacement for the traditional lecture. Student performance on exams also has improved. Pre-TIPS, students usually performed weakly on this subject compared with overall head and neck exam results. With TIPS, scores in this area have improved steadily, now surpassing other topics. Because of the success of TIPS, we intend to produce additional self-directed lessons in key topics that will benefit most from the use of computer technology.

WISE, Gary E., Fenghui PAN*, and Shaomian YAO*. Department of Comparative Biomedical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA. Chronological expression of parathyroid hormone-related protein in the stellate reticulum of the rat first mandibular molar.

Tooth eruption is a localized event that requires the expression of certain molecules at precise times and parathyroid hormone-related protein (PTHrP) is one of those molecules. Although it is known that PTHrP is produced in the stellate reticulum (SR) of the tooth and exerts its effect on the adjacent dental follicle, the chronology of gene expression of PTHrP is not known. To determine this, mandibles were surgically removed from new-born rats at days 1, 3, 5, 7, 9 and 11 and frozen in liquid nitrogen. Frozen sections (20 μ m) of the first molar were cut, fixed with ethanol and stained with toluidine blue. Laser capture microdissection (LCM) was then used to excise the SR, followed by isolation of RNA and subsequent RT-PCR to measure gene expression. The results demonstrated that PTHrP was maximally expressed at day 7 postnatally. The

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expression level at day 9 was not significantly different from day 7. All of the other days had significantly less expression than at day 7. Because the secondary burst of osteoclastogenesis needed for eruption occurs around day 10, it is possible that PTHrP is stimulating this osteoclastogenesis. (Sponsored by Grant No. DE08911-14 to G.E.W. from the National Institutes of Health).

YAQOOB*, M., R. DIAS*, A. TEMPLE*, D. SHANNAHAN, and S. DESHMUKH*. The Royal Orthopaedic Hospital, Birmingham. Dept. of Anatomy, Newcastle University. How safe is the median nerve? A cadaveric study assessing the accuracy of injecting into the carpal tunnel.

Therapeutic injection into the carpal tunnel is a well established treatment modality in the management of carpal tunnel syndrome. We undertook a cadaveric study evaluating the accuracy of injecting into the carpal tunnel and particularly noting any inadvertent injections into the median nerve. Two investigators injected permanent ink into five cadaveric hand each. Each investigator used one of two documented injection techniques. One method involved injecting in the interval between flexor carpi radialis and palmaris longus at the level of the distal palmar wrist crease and directing the needle 45⁰ degrees ulnawards. The second method involved positioning at the same wrist level but in line with the fourth axial ray and directing the needle 45⁰ radially and posteriorly. Each of the hands was then dissected and results documented. The results showed no difference in accuracy between the two methods, however on four dissections the needle tip had entered or was in immediate proximity to the median nerve. The mean distance from the median nerve was 3 mm. The study reveals that injection is safe but the median nerve can be inadvertently injected.

ZHANG ^{1*}, Shao-Xiang, Pheng-Ann HENG², Zheng-Jin LIU¹, Li-Wen TAN¹, Rong-Xia LIAO¹. ¹Department of Anatomy, College of Medicine, Third Military Medical University, Chongqing, CHINA. ²Virtual Reality, Visualization and Imaging Research Centre, Department of Computer Science and Engineering, Chinese University of Hong Kong, Hong Kong, CHINA. Chinese Visible Human Project.

Digital visible human has become a hot topic in anatomy and computer science as well. Due to demand for digital visible human in various fields related to human morphology, including medicine, sports, bionics, advertisement making, and the aerospace industry, etc. Visible Human Research (VHR) is undoubtedly promising and

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far-reaching in the digital era. The US VHP created the first digital image data set of complete human male and female in 1995. To promote worldwide application-oriented VHR, more visible human data sets representative of different populations of the world are in demand. Encouraged by the theoretical importance and vast vistas of applications of VHR, many Chinese scholars represented all medical specialties and relevant areas of computer science have been paying great attention to the research progress. They think that the China should contribute to the worldwide VHR through developing a human data set representing an Asian population. Our research team at the Third Military Medical University has been involved in study on Human Sectional Anatomy and computerized 3D reconstruction since 1985. We have been focusing on Human Thin Sectional Anatomy since 1990. With grants from the National Science Foundation of China for Distinguished Young Scholars, we began construction of our special low temperature lab and technique research on acquiring the Chinese Visible Human (CVH) data set in 1999. At last, data set acquisition of the first CVH Male was finished at the Third Military Medical University, and 3D visualization of it was achieved at the Chinese University of Hong Kong in October 2002. The data set acquisition for the CVH Female was completed in February 2003. This marks China's status as the second country in the world to develop the visible human male and female data sets. So far, we have achieved acquisition of five CVH data sets and their volume visualization on PC. The CVH male and female project achieved greater integrity of images, easier blood vessel identification, and was free of organic lesion. The most noteworthy technical advance of CVH Project was construction of a low temperature laboratory, which contributed to prevention of small structures (including teeth, concha nasalis, and articular cartilage) from falling off of the milling surface. Thus, better integrity of images was ensured. Up to now, 3D reconstruction of some organs or structures has been finished. The work of segmentation of a complete data set is also under way. Although there is still a distance to go to make visible human meet the application-oriented needs in various fields, we're taking our first step toward future application by acquiring new data sets, performing segmentation and setting up a platform of computer-assisted medicine. The CVH Project (CVHP) calls for international collaboration between human anatomists, computer experts and the scientists in the related fields of the world.

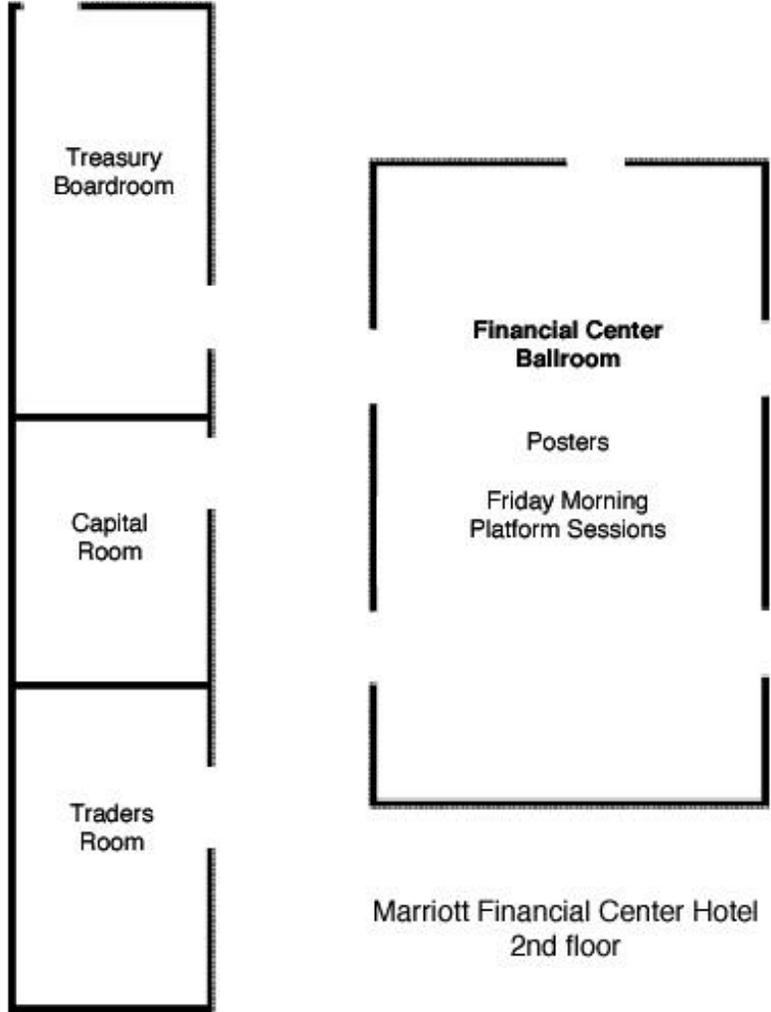
ZURADA* Anna, Jerzy St. GIELECKI*[#], Grzegorz GAJDA*, Niket SONPAL, and Shawn KALEKA*. Department of Anatomy, Medical

Abstracts

University of Silesia, Katowice, POLAND. #Department of Anatomical Sciences, Medical School, The University of Adelaide, Adelaide SA 5005, AUSTRALIA. (sponsored by S. W. Carmichael). Computer simulation of the cerebral blood flow using patient-oriented models of the Circle of Willis.

The circle of Willis is an evolutionarily and anatomically significant structure. An interactive virtual reality 3D visualization program was used to analyze the CT angiography of a 50 year old living female with an enlarged basilar artery. The patient's vessel diameter and length were measured, and used to simulate blood flow in the circle of Willis. Once normal blood flow values were obtained, the program was then able to simulate pathological situations such as arteriosclerosis or complete occlusions of contributing arteries of the circle of Willis. Upon occlusion of BA, decreases in the blood flow were seen in the pre/postcommunicating segments of the PCA, while increases were noticed in both ICA, and within the PCoA. Additionally upon occlusion of ICA, decreases in blood flow were seen in the ipsilateral MCA and postcommunicating segment of ACA, but not within the contralateral MCA, PCoA, precommunicating PCA, and postcommunicating segments of the PCA and ACA. However significant increases were noticed within the ACoA and contralateral precommunicating ACA. This aspect of the occlusion is clinically significant due to the high number of aneurysms seen in ACoA, and with implementation of IVR3 as a diagnostic tool clinicians may be able to prevent such vascular failures.

Floorplan/Directory Map



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