29th ANNUAL MEETING:
AMERICAN ASSOCIATION OF 
CLINICAL ANATOMISTS
www.aacameeting.org

JULY 8-13, 2012
GRENADA, WEST INDIES

HOSTED BY:
DEPARTMENT OF ANATOMICAL SCIENCES
ST. GEORGE’S UNIVERSITY
Dear Colleagues,

We are happy to announce that the 29th Annual Meeting of the American Association of Clinical Anatomists will be held at St. George’s University in Grenada from July 8-13, 2012.

Grenada is a wonderful country, steeped in culture and history in the southeast part of the Caribbean. St. George’s University is located at the southern part of the island, spread over 42 acres in a vibrant seaside location, in this lovely tropical island in the West Indies. St. George’s University was the first private University in the Caribbean, established in 1976. Now, with nearly 11,000 graduates practicing medicine across the world, a campus that includes professors and students from over 140 different countries, and a clinical training program involving over 60 hospitals in the US and the UK, St. George’s University has earned a worldwide reputation as a leading international center for medical education and a beacon of academic excellence. For over 30 years now, the University’s dedication to developing outstanding physicians has improved health standards and healthcare delivery systems throughout the world (for more information, go to: www.sgu.edu).

The meeting venues, “Charter Hall and Taylor Hall,” are conveniently located in the center of St. George’s University and are within walking distance from the lodging accommodations and the beach.

The combination of a Caribbean environment and the excellent academic center of St. George’s University will provide participants with unique opportunities for collaboration, exchange of ideas in anatomy, education and innovation, and an update of the latest developments in all the topics of clinical and surgical anatomy.

It is our pleasure to host the 29th Annual Meeting of the AACA on campus and to provide a meeting of high scientific quality with oral presentations, posters, video presentations, and a postgraduate course dedicated to ultrasound and medical education.

We would like to express our greatest thanks to the AACA for giving us the opportunity and challenge of hosting this meeting.

Sincerely,

Marios Loukas
Chair, Department of Anatomical Sciences
St. George’s University
President’s Greeting and Report

July 8 - 13, 2012
St. George’s University
Grenada

Welcome to the AACA’s 29th Annual Scientific Meeting at St. George’s University on the beautiful island of Grenada. We thank Marios Loukas and his exceptionally well organized team and St. George’s University for hosting this unique, all inclusive meeting. In addition to the regular Scientific Meeting and Postgraduate Course, everything from accommodations and meals to daily adventure activities has been planned for our complete enjoyment. This would not have been possible without the generosity of St. George’s University and:

- Marios Loukas, our local host and his committee,
- Mark Seifert, our Program Secretary, as well as the MOPP committee chaired by Mark,
- Bob DePhilip, Chair of the 2012 Annual Meeting Committee, along with the committee members,
- Julie Hewett, our Meeting Manager and her JulNet Solutions team,
- Educational Affairs Committee and Chair, Rebecca Pratt
- Career Development Committee and Co-Chairs, Brion Benninger and Rebecca Lufler
- Anatomical Services Committee and Co-Chairs, Brandi Schmitt and Len Cleary
- Clinical Anatomical Terminology Committee and Chair, Sherry Downie

The number of hours that these individuals and Committees have contributed to the success of this meeting is astronomical. The AACA extends its gratitude to all of you!

We would also like to acknowledge and thank our Exhibitors who have come to Grenada. Many of them have been participating in our meetings for a long period of time – please visit the exhibits and see what is new and innovative in all areas of Anatomical Sciences.

Many exciting developments have taken place since our last meeting in Ohio. At the Interim Council Meeting in October, a new bylaw for the Journal Committee was approved which made Brian MacPherson, President-Elect, Chair of the Journal Committee and the AACA Council as the final decision-making body with regards to the Journal. Brian and Heikki Whittet, BACA President, worked diligently together and with their respective committees to select a new Editor-in-Chief of Clinical Anatomy. Both AACA and the BACA extend a warm welcome to our next Editor-in-Chief, Shane Tubbs. Congratulations to Shane! To add to the excitement, renegotiation of our Journal contract with Wiley is underway.

We also owe gratitude to Noelle Granger and Art Dalley for writing our Call for Proposals for professional management associations who had indicated an interest in AACA management. Three management groups submitted proposals which were presented to Council at a Special Council meeting in March 2012. All of the proposals were well presented, each with their own strengths. The Council voted to pursue final negotiations with the Associated Services Group (ASG), Charles Hall, President, a process which has resulted in the preparation of a final contract to take effect on July 1, 2012. We extend a warm welcome to Shanan Molnar, our new ASG Manager, to participate in our meeting in Grenada, where she is looking forward to meeting our membership and familiarizing herself with our Association.
Our Strategic Planning initiative is well underway, under the guidance of Larry Spraggs, President of eduStrategists. The Council was engaged first in September, by e-mail, and then by a brainstorming session at the Interim Council Meeting in October. Peter Ward and his group worked with Larry in consolidating the ideas into five areas of focus. Two working groups are starting to delve into two of the areas of focus – membership and promotion of the AACA.

The Special Interest Group Committees have not only worked all year on preparing for this meeting, but also have continued with their own initiatives described in their reports. In particular, the Clinical Anatomical Terminology Committee (CAT), chaired by Sherry Downie, is now our fourth Special Interest Group, in addition to the Educational Affairs (EAC), Career Development (CDC) and Anatomical Services (ASC) Groups. The CAT committee will elect their first members at the Grenada meeting. I encourage everyone to participate at the SIG Committee breakfasts and become active contributors to these very important Committees.

In December, as AACA President, I had the privilege of attending the BACA winter meeting held jointly with the Anatomical Society (AS) and the Institute of Anatomical Sciences (IAS) in Cardiff, Wales. Attendance at the BACA Executive Meeting enabled discussion of our mutual concerns and a reaffirmation of our sister Association’s long collegial history. The most memorable occasion at the meeting was the presentation of the AACA Honored Member Award to Professor Harold Ellis, a most distinguished surgeon, anatomist, statesman, and teacher. It was a pleasure to have the opportunity to meet the BACA Executive Council and membership.

Our highest AACA honors this year have been awarded to two outstanding colleagues. The recipient of the Honored Member Award is Dr. Ronald Bergman. The Benton Adkins, Jr. Distinguished Service Award will be received by Dr. Keith Moore. Dr. Bergman is unable to travel to Grenada due to health reasons, so he was presented with his award at a special dinner at our Council meeting in March. Dr. Bergman’s family members were present at this momentous occasion! A video will be available on the AACA website thanks to Peter Ward. Dr. Moore will receive his award in Grenada.

Once again, thanks to Sherry Downie and the members of the Nominating Committee, for presenting an excellent slate of candidates for our 2012 ballot. We congratulate all of the individuals who were on the ballot for their commitment to the AACA. Welcome to the newly elected members of Council: Noelle Granger (Program Secretary), Brandi Schmitt (Special Councilor, Anatomical Sciences), and Brion Benninger and Sarah Keim (Councilors-at-Large). To Mark Seifert, our outgoing Program Secretary, our thanks for a job well done. You have raised the bar in the way in which we plan and execute our meetings. Efficient, forward thinking is the new norm and the results are evident for all to see.

We have an energetic group of hard working volunteers. This includes those serving on the Council, Executive Committee, and Editorial Board of Clinical Anatomy, as well as those serving on the many SIG and planning committees that are vital to the AACA activities. As the first year of my Presidential term is ending, I am happy to report that we have good momentum moving forward made possible by our strong teamwork.

Anne Agur, President
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgement and Thanks to our Sponsors and Exhibitors</td>
<td>9</td>
</tr>
<tr>
<td>Pre-Meeting Events</td>
<td>11</td>
</tr>
<tr>
<td>Scientific Program</td>
<td>13</td>
</tr>
<tr>
<td>Presidential Speaker – Linda Wilson-Pauwels</td>
<td>25</td>
</tr>
<tr>
<td>Honored Member – Ronald Bergman</td>
<td>27</td>
</tr>
<tr>
<td>Distinguished Service Award – Keith Moore</td>
<td>29</td>
</tr>
<tr>
<td>Post Graduate Course</td>
<td>31</td>
</tr>
<tr>
<td>Anatomical Services Committee Symposium</td>
<td>33</td>
</tr>
<tr>
<td>Educational Affairs Committee Symposium</td>
<td>35</td>
</tr>
<tr>
<td>Career Development Committee Symposium</td>
<td>37</td>
</tr>
<tr>
<td>Poster Listing</td>
<td></td>
</tr>
<tr>
<td>Poster Session 1</td>
<td>39</td>
</tr>
<tr>
<td>Poster Session 2</td>
<td>42</td>
</tr>
<tr>
<td>Poster Session 3</td>
<td>45</td>
</tr>
<tr>
<td>Annual Business Meeting Agenda</td>
<td>49</td>
</tr>
<tr>
<td>Officers of the AACA Council</td>
<td>51</td>
</tr>
<tr>
<td>Clinical Anatomy – the Official Journal of AACA</td>
<td>52</td>
</tr>
<tr>
<td>Committee Reports</td>
<td>53</td>
</tr>
<tr>
<td>Anatomical Services Committee</td>
<td></td>
</tr>
<tr>
<td>Career Development Committee</td>
<td></td>
</tr>
<tr>
<td>Clinical Anatomical Terminology Committee</td>
<td></td>
</tr>
<tr>
<td>Educational Affairs Committee</td>
<td></td>
</tr>
<tr>
<td>Journal Committee</td>
<td></td>
</tr>
<tr>
<td>Meeting Oversight and Program Planning Committee</td>
<td></td>
</tr>
<tr>
<td>Membership Committee</td>
<td></td>
</tr>
<tr>
<td>Nominating Committee</td>
<td></td>
</tr>
<tr>
<td>2012 Annual Meeting Committee</td>
<td></td>
</tr>
<tr>
<td>Abstract listing by Author</td>
<td></td>
</tr>
<tr>
<td>Platform Presentations</td>
<td>69</td>
</tr>
<tr>
<td>TechFair Presentations</td>
<td>90</td>
</tr>
<tr>
<td>Poster Presentations</td>
<td>92</td>
</tr>
</tbody>
</table>
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 Taylor Hall.

American Association of Anatomists
Amirsys / AnatomyOne
Elsevier
General Electric
Gubener Plastinate GmbH
Holt Anatomical
Lippincott Williams & Wilkins/Wolters Kluwer Health
Thieme Medical Publishers
Touch of Life Technologies
Wiley-Blackwell
Pre-Meeting Events
Sunday July 8

8:30 – 4:30  AACA Council Meeting  DOS Room

10:00 – 3:00  Rum and Chocolate Factory Tour

5:00 – 6:00  Judges’ Meeting  DOS Room

6:00 – 9:00  Welcome Reception with Honored Members  Taylor Hall

  Anne Agur, Ph.D.
  President, American Association of Clinical Anatomists

  Marios Loukas, M.D., Ph.D.
  Dean of Research and Local Host

  Allen Pensick, Ph.D.
  Provost, St. George’s University

  George Vincent, Ph.D.
  Minister of Tourism

  Mr. Colin Dowe
  Chairman, Board of Tourism
Scientific Program
Monday, July 9

7:00 - 8:00  “Introduction to the AACA” Breakfast  
            Taylor Hall

8:00 - 8:30  Break with Exhibitors  
             Taylor Hall

8:30 - 9:00  Opening of Scientific Session  
             Charter Hall

Anne Agur, Ph.D.  
President, American Association of Clinical Anatomists

Jeffrey Laitman, Ph.D.  
President, American Association of Anatomists

Marios Loukas, M.D., Ph.D.  
Dean of Research and Local Host

Allen Pensick, Ph.D.  
Provost of St. George’s University

Mrs. Anne Peters  
Minister of Health, Grenada

George Mitchell, M.D.  
Chief Medical Officer, Grenada

9:00 - 10:00  Presidential Speaker: Linda Wilson-Pauwels  
              Charter Hall

10:00 - 10:30  Break with Exhibitors  
               Taylor Hall

10:30 - 12:00 Platform Session 1 – Anatomy in a 21st Century Curriculum (Moderator: Cristian Stefan)  
Charter Hall

10:30  Quo Vadis: Teaching anatomy to 1,300 medical students per year at St. George’s University.  
LOUKAS, Marios, Robert HAGE, Danny BURNS, Robert JORDAN, Vishnu RAO, Brian CURRY, Feisal BRAHIM, Ewarld MARSHALL, Kathleen BUBB, Alena WADE, Rachel GEORGE, and Shubhra BARHUAH. St. George’s University, St. George’s, Grenada, West Indies.

10:45  Finding anatomy through the internet: Ranking websites that list online anatomy resources.  
FLEMING, Scott, Alan E. SEYFER, David R. WELLING. Department of Anatomy, Physiology and Genetics and the Department of Surgery, Uniformed Services University of the Health Sciences, Bethesda, MD 20814, USA.

11:00  Starting from scratch: Our experience in building a new anatomy program in Israel.  
BARASH, Alon, Michael WEINGARTEN, Anthony LUDER, David KARASIK. Faculty of Medicine in Galilee, Bar Ilan University, Safed, Israel.
11:15 Developing student dissection assessment: Novel scoring method, BENNINGER, Brion1-8 and William MERBS1. Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon OR, Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon and Corvallis, OR. Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA.

11:30 21st Century anatomy dissection lab: Classic vs. millennial, MATSLOER, Nikolaus1 and Brion BENNINGER1-8. Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences Lebanon, OR. Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon and Corvallis OR. Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA. (GER)

11:45 Enhancing the anatomical knowledge of clinical phase medical students using a novel interactive teaching package, TUNSTALL, Richard and Miles HARRISON. School of Graduate Entry Medicine and Health, University of Nottingham, Nottingham, United Kingdom.

12:00 – 1:30 Lunch Taylor Hall
12:00 – 1:30 Clinical Anatomical Terminology Committee Lunch Taylor Hall A
1:30 - 3:15 Platform Session 2 – Head & Neck Anatomy (Moderator: Kathleen Bubb ) Charter Hall
1:30 Videographic techniques for exploring the inner ear, ACLAND, Robert D.1 and Mark MOBLEY2. 1Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY 40292, USA. 2Warwick Medical School, Coventry, CV4 7AL, UNITED KINGDOM.

1:45 Bringing light to the labyrinth: A new view of the inner ear, MOBLEY, Mark S.1 and Robert D. ACLAND2. 1Warwick Medical School, Coventry, CV4 7AL, UNITED KINGDOM, and 2Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY 40292, USA.

2:00 Defining the surface anatomy of the parotid duct in vivo, MIRJALILI, S.A., J.C. MUIRHEAD, and M.D. STRINGER. Department of Anatomy, University of Otago, Dunedin, New Zealand.

2:15 A cranial nerve Skywalk: Dental student perceptions of a 3D Tutorial of cranial nerves III, V, VII, and IX in a virtual platform, RICHARDSON, April, Matt HAZZARD2, Paul BROWN3, and German RAMIREZ4. 1Anatomy and Neurobiology Department, University of Kentucky, Lexington, KY 40536, USA; 2Academic Technology Group, University of Kentucky, Lexington, KY 40536, USA; 3Division of Clinical Anatomy, Stanford University,
Architecture and functional characteristics of the supra- and infrahyoid muscles: A three-dimensional modeling study. 

RAVICHANDIRAN, Mayoorendra, Joel DAVIES, William PEARSON, and Anne AGUR. Department of Surgery, University of Toronto, ON, Canada, and Department of Anatomy and Neurobiology, Boston University School of Medicine, Boston, MA 02118, USA. 

2:45 

Ultrasound investigation of the musculotendinous architecture of supraspinatus following concentric and eccentric exercise training: a pilot study. 

KIM, Soo Y., Tanner SCHATZ, and Scotty BUTCHER. College of Medicine, School of Physical Therapy, University of Saskatchewan, Saskatoon, SK, S7N 0W3, CA. 

3:00 

An anatomic study of the course of the suprascapular nerve. 

AKITA, Keiichi, Atsushi TASAKI, Akimoto NIMURA, Tomoyuki MOCHIZUKI, Kumiko YAMAGUCHI, Ryuichi KATO, Yoshimitsu HOSHIKAWA, Hiroyuki SUGAYA. Tokyo Medical and Dental University, Tokyo, 113-8519, JAPAN. 

3:15-3:30 

Break to assemble for outdoor activity 

3:30-6:00 

Outdoor Activity: Waterfalls/Hiking 

7:00 

Dinner and Mentor Reception  

Taylor Hall
Scientific Program
Tuesday, July 10

7:00 – 8:00  Educational Affairs Committee Breakfast  Taylor Hall A
7:00 – 8:30  Breakfast with Exhibitors  Taylor Hall
8:30 – 10:00 Platform Session 3 – Anatomy in Translational Research
(Moderator: Jonathan Wisco)  Charter Hall

8:30  How to expand translational research through use of cadaveric material: Current studies and results. LAMBERT, H. Wayne, Jacob N. FOX, Stavros ATSAS, Sean C. DODSON, Blake T. DANÉY, Mackenzie J. CLARKSON, Jonathan J. WISCO. West Virginia University, Morgantown, WV 26506, USA. University of California-Los Angeles, Los Angeles, CA 90095, USA.

8:45  The visualization of ganglion local neuronal density remodeling in chronic MI. WISCO, Jonathan J.1,2, Nathan S. HAGEMAN1,2, Olujimi A. AJIJOLA3,4, H. Wayne LAMBERT5, Jacob N. FOX6, Aman MAHAJAN3,4,5, Michael C. FISHBEIN2, Kalyanam SHIVKUMAR3,4, and M. Elena STARK1,2. 1Laboratory for Translational Anatomy of Degenerative Diseases and Developmental Disorders, Division of Integrative Anatomy; 2Department of Pathology and Laboratory Medicine; 3Cardiac Autonemics Group, Gail and Gerald Oppenheimer Family Center for Neurobiology of Stress; 4Cardiac Arrhythmia Center; 5Department of Cardiac Anesthesia, David Geffen School of Medicine at UCLA, Los Angeles, CA 90095, USA, USA; and 6Department of Neurobiology and Anatomy, Robert C. Byrd Health Sciences Center, West Virginia University, Morgantown, WV 26506, USA.

9:00  Ultrasound as a teaching tool in anatomy classes in an integrated medical curriculum. LARKIN, Theresa, Darryl McANDREW, Noel TAIT, and Saheeda ZOTTER. Graduate School of Medicine, University of Wollongong, NSW, Australia.

9:15  Quantitative study of articular pillars in typical cervical vertebrae as guidelines to the lateral mass screws. SANGARI, Santosh K., Thomas E. HEINEMAN, Paul-Michel F. DOSSOUS, and Estomih P. MTUI. Program in Anatomy and Body Visualization, Cell and Developmental Biology, Weill Cornell Medical College, New York, NY 10065, USA.

9:30  Anatomical injury of restrained cadavers in frontal collision testing. PORTA, David J., Andrew R. KEMPER, Stephanie M. BEEMAN, and Stefan M. DUMA. Department of Biology, Bellarmine University, Louisville, KY 40205, USA and the School of Biomedical Engineering and Sciences, Center for Injury Biomechanics, Virginia Tech University, Blacksburg, VA 24061, USA.
Endocardiac endoscopic lead extraction: A cadaver feasibility study. **TURNER,** Benjamin, Alesha PRIOR, Timothy ROACH, Deon FORRESTER, R. Shane TUBBS, Marios LOUKAS. St. George's University, St. George’s, Grenada, West Indies. (GER)

**10:00 – 10:30** Break with Exhibitors

**10:30 – 12:00** Session 4 – TechFair: (Moderator: Jon Jackson)

**10:30** Introduction to radiology of the back. **WINESKI,** Lawrence, Patrick ABRAMSON, Jinjie ZHENG, and Rebecca SEALAND. Department of Pathology and Anatomy, Division of Information Technology, Morehouse School of Medicine, Atlanta, GA 30310, USA.

**10:40** Using a blended learning environment to enhance courses in a professional curriculum. **MacPHerson,** Brian R.1 and Jerry G. TIEMAN2. 1Anatomy and Neurobiology, and 2College of Dentistry, University of Kentucky, Lexington, KY 40536, USA.

**10:50** Anatomy Pro:Tracts – An iPad game to teach gastrointestinal anatomy and its clinical implications. **SALKOWSKI,** Lonie R.1, R. Benjamin SHAPIRO2; Greg VAUGHAN2, Aaron BAHR2, Allison SALMON2, Brian PELLETIER2, Jake RUESCH2, and Kurt SQUIRE2,3. University of Wisconsin School of Medicine and Public Health, Department of Radiology1; Wisconsin Institutes for Discovery, Educational Research Integration Area2; and University of Wisconsin, School of Education, Department of Curriculum and Instruction3, Madison, WI 53792, USA.

**11:00** Development of a 3D learning resource of the pterygopalatine fossa using cone beam computed tomography for dental students. **CASPER,** Ryan J. and Neil S. NORTON. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE 68178, USA.

**11:10 – 12:00** Post-TechFair Discussion and Hands-On Interaction

**12:00 – 2:00** Lunch and Poster Session 1

**Clinical Anatomy Editorial Board Lunch**

**2:00 – 3:30** Educational Affairs Symposium

**3:30 – 6:00** Outdoor Activity: Dolphin Watch/Snorkeling

**7:00** Dinner
**Scientific Program**  
**Wednesday, July 11**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00 – 8:00</td>
<td>Career Development Committee Breakfast</td>
<td>Taylor Hall A</td>
</tr>
<tr>
<td>7:00 – 8:30</td>
<td>Breakfast with the Exhibitors</td>
<td>Taylor Hall</td>
</tr>
<tr>
<td>8:30 – 10:00</td>
<td>Platform Session 5 – Thorax, Abdomen &amp; Pelvis (Moderator: Tony Weinhaus)</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>8:30</td>
<td>The anatomy of the aortic root, ALI, M. Irfan, Ewarld MARSHALL, Benjamin TURNER, Michael SNOSEK, R. Shane TUBBS, Robert H. ANDERSON, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies. (GER)</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>8:45</td>
<td>An endoscopic approach to the valve of the inferior vena cava, ROACH, Timothy, Alesha PRIOR, Ewarld MARHSALL, Alena WADE, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies. (GER)</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>9:00</td>
<td>Arterial supply of segment IV of the liver and its relevance to living donor tissue transplantation and split liver transplantation, SAHNI, Daisy and Shallu GARG. Department of Anatomy Postgraduate Institute of Medical Education and Research, Chandigarh, India 160012.</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>9:15</td>
<td>Pericardiocentesis: Combining novel subxiphoid-right subclavian joint approach with a thorax dissection lab for a clinical experience, DIEGEL, Julien1 and Brion BENNINGER.1-8 Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon, OR. Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon and Corvallis, OR. Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA. (GER)</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>9:30</td>
<td>Towards a highly-detailed three-dimensional pelvic model: Approaching an ultraspecific level for surgical planning, DERUITER, Marco C., Anne C. KRAIMA, Noeska N. SMIT, Daniel JANSMA, Cornelis. J. H. van de VELDE, and Charl P. BOTA. Leiden University Medical Center, P.O. Box 9600, 2300 RC Leiden, The Netherlands.</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>9:45</td>
<td>Nerves of the external genitalia in man from a viewpoint of comparative anatomy (including a dissection DVD), SATO, Tatsuo. Tokyo Ariake University of Medical and Health Sciences, Tokyo 135-0063 Japan.</td>
<td>Charter Hall</td>
</tr>
<tr>
<td>10:00 – 10:30</td>
<td>Break with Exhibitors</td>
<td>Taylor Hall</td>
</tr>
<tr>
<td>10:30 – 12:00</td>
<td>Platform Session 6 – Upper Limb (Moderator: April Richardson)</td>
<td>Charter Hall</td>
</tr>
</tbody>
</table>
10:30 An architecturally comprehensive 3D model of the intrinsic musculotendinous structures of the hand. Li, Zhi, Kajendra RAVICHANDIRAN, Dongwoon LEE, Nancy MCKEE, and Anne AGUR. Departments of Surgery and Computer Science, University of Toronto, Toronto, ON, M5S 1A8, CA.

10:45 Intercostal to long thoracic nerve transfer for the treatment of winged scapula - Cadaveric feasibility study. KOLIAS, Theofanis, Robert G. LOUIS Jr, R. Shane TUBBS, Jeffrey ELIAS, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies. (GER)

11:00 Infraclavicular brachial plexus blocks: Comparison of neonatal and adult anatomy. VAN SCHOOOR, Albert-Neels, Marius C. BOSMAN, and Adrian T. BOSENBERG. 1Department of Anatomy, University of Pretoria, Pretoria, South Africa. 2Department of Anesthesiology, Seattle Children’s Hospital, Seattle, WA 98105, USA.

11:15 Ulnar nerve innervation of the medial head of the triceps brachii muscle: A cadaveric study. SNOSEK, Michael, Sharath BELLARY, Neslihan CANKARA, Mohammadali M. SHOJA, R. Shane TUBBS, Robert J. SPINNER, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (GER)

11:30 3D printing of carpal fusion: A new approach to experimental anatomy. FOGG, Quentin A. Laboratory of Human Anatomy, School of Life Sciences, University of Glasgow, Glasgow, G128QQ, United Kingdom.

11:45 A three-dimensional investigation of the pathologic supraspinatus. KIM, Soo Y, and Dali LI. College of Medicine, School of Physical Therapy, University of Saskatchewan, Saskatoon, SK, S7N 0W3, CA.

12:00 – 2:00 Lunch and Poster Session 2
2:00 – 3:30 Career Development Symposium
3:30 – 3:45 Break with Exhibitors
3:45 – 5:15 Business Meeting
7:00 Gala Banquet with Prime Minister, Chancellor, AACA Honored Member, Service Award Member, and Banerji Awardee
Scientific Program
Thursday, July 12

7:30 – 8:30  Anatomical Services Committee Breakfast  Taylor Hall A

7:30 – 9:00  Breakfast with Exhibitors  Taylor Hall

9:00 – 10:15  Platform Session 7 – Anatomical Gifts (Moderator: Carlos Suarez-Quian)  Charter Hall

9:00  Anatomical materials: Training researchers, students and clinicians in the safe and respectful use of donor specimens. SCHMITT, Brandi,1 Andrew CORSON,2 and Charlotte WACKER3. 1Health Sciences and Services, University of California, Office of the President, Oakland, CA 94607, USA; 2Willed Body Program, University of California San Francisco, San Francisco, CA 94143, USA; 3Body Donation Program, University of California Davis, Sacramento, CA 95820, USA.

9:15  A re-designed embryology course with practical exams and a lab featuring fetuses and embryos. WEINHAUS, Anthony J. and Mark S. COOK. Department of Integrative Biology and Physiology, University of Minnesota, Minneapolis, MN 55455, USA.

9:30  The anatomy of the caudal space in fetuses as applied to caudal block. AGGARWAL, Anjali1, Daisy Sahni1, Y. Harjit1, K. Batra2, and R. Sondekkoppam2. 1Department of Anatomy, 2Department of Anesthesia Postgraduate Institute of Medical Education and Research, Chandigarh, India 160012.

9:45  Can anatomic traits help with misidentifying the mendosal suture with a fracture? A radiologic study. GURSES, I. Ali¹, Asim ESENKAYA², Ozcan GAYRETLI², Aysin KALE³, Adnan OZTURK¹, Aylin TEKES³. ¹Istanbul University, Istanbul Faculty of Medicine, Department of Anatomy, Istanbul, 34390 Turkey. ²Istanbul University, Cerrahpasa Faculty of Medicine, Department of Radiology, Istanbul, 34098 Turkey. ³Johns Hopkins Hospital, Department of Radiology and Radiological Science, Division of Pediatric Radiology, Baltimore, MD 21287, USA.

10:00  Mold on cadavers: Indigenous or imported? DOBBINS, Joanne J. and David J. PORTA. Department of Biology, Bellarmine University, Louisville, KY 40205, USA.

10:15 - 10:30  Break with Exhibitors  Taylor Hall

10:30 - 12:00  Platform Session 8 – Lower Limb (Moderator: Albert van Schoor)  Charter Hall

10:30  Interosseous membrane of the leg: The anatomic basis for combined ankle and common fibular (peroneal) nerve injuries/lesions. SPINNER, Robert J., R. Shane TUBBS, and Kimberly K. AMRAMI. Mayo Clinic, Rochester, MN 55905, USA.
10:45 Tibial tuberosity: A morphological mystery with clinical significance. POST, Kevin¹ and Brion BENNINGER¹-⁸. Departments of Anatomy¹, Family Medicine², COMP-Northwest, Western University of Health Sciences, Lebanon, OR; Orthopaedics³, General Surgery⁴ Samaritan Health Services, Lebanon and Corvallis, OR. Departments of Orthopaedic Surgery and Rehabilitation⁵, Surgery⁶, Integrative Biosciences⁷, Oral Maxillofacial Surgery⁸, Oregon Health and Science University, Portland, OR 97239, USA. (GER)

11:00 The anatomical relationships of the gastroc-soleus and fibularis longus muscles, determining the practicality of a novel tendon transfer. PATTERSON, Paul R.¹, Bobby M. SIDIQUII, James B. PENNY¹, Malik S. SIDDIQUE², C. Senthil KUMAR³, and Quentin A. FOGG⁴. ¹Queen Elizabeth Hospital, Gateshead. Queen Elizabeth Avenue, Sheriff Hill, Gateshead, Tyne and Wear. NE9 6SX, UK; ²Freeeman Hospital, Freeman Road, High Heaton, Newcastle-upon-Tyne, NE7 7DN, UK; ³Glasgow Royal Infirmary 84 Glasgow St, Glasgow, Glasgow City G4 0SF UK; ⁴Laboratory of Human Anatomy, School of Life Sciences, University of Glasgow, Glasgow, G128QQ, UK.

11:15 A 3D model of vastus medialis oblique fibre bundle architecture. SOHAIL, Zain¹, Kate SAUKS¹, Kajeandra RAVICHANDIRAN¹, Judi LAPRADE¹, Dongwoon LEE¹, ² and Anne AGUR¹. Department of Surgery¹ and Department of Computer Science², University of Toronto, Toronto, ON, M5S 1A8, CA.

11:30 Anatomic, histologic, and radiographic study of the fibular collateral ligament. CHAPPELL, Todd M. ¹, Prakash PANCHANI¹, Garrett D. MOORE¹, R. Shane TUBBS², Mohammadali M. SHOJA², Marios LOUKAS³, Piotr B. KOZLOWSKI⁴, Khurram H. KHAN⁵, Anthony C. DILANDRO⁶, and Anthony V. D’ANTONI⁶. ¹New York College of Podiatric Medicine, New York, NY 10035, USA; ²Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA; ³Department of Anatomical Sciences, St. George’s University, Grenada; ⁴Touro College of Osteopathic Medicine, New York, NY 10027, USA; ⁵Division of Clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035, USA; ⁶Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035, USA.

11:45 An endoscopic and ultrasound approach to the valves of the small saphenous veins. PRIOR, Alesha, Timothy ROACH, Benjamin TURNER, Kathleen BUBB, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (GER)

12:00 – 2:00 Lunch and Poster Session 3   Taylor Hall
12:00 – 2:00 2013 Annual Meeting Committee Lunch   Taylor Hall A
2:00 – 3:30 Anatomical Services Symposium   Charter Hall
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<tr>
<td>3:30 – 3:45</td>
<td>Closing Remarks &amp; Adjournment</td>
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<td>4:00 – 6:00</td>
<td>City Tour</td>
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<td>7:00</td>
<td>Awards Presentation and Dinner</td>
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### Scientific Program

**Friday, July 13**

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<tr>
<td>6:45 – 8:00</td>
<td>Meeting of New AACA Council</td>
<td>DOS Room</td>
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<td>8:00 – 4:15</td>
<td>Post Grad Course</td>
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<td>Science Building</td>
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<tr>
<td>6:00</td>
<td>“Fish Friday” – Bus leaves at 6:00 for dinner in Gouyave, weather permitting; otherwise dinner at Taylor Hall at 7:00</td>
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Linda Wilson-Pauwels is a tenured Professor in Biomedical Communications, Department of Biology at the University of Toronto, Mississauga campus, and an Associate Member of the Institute of Medical Science in the Faculty of Medicine at the University of Toronto. Her interdisciplinary background includes 4 years of study at the Ontario College of Art and Design, a Bachelor of Science in Art as Applied to Medicine, and a Master and Doctoral degree in Higher Education in medicine from the University of Toronto.

From 1986 to 2008, Linda served as the Acting Chair of the Department of Art as Applied to Medicine, the Chair of the Division of Biomedical Communications in the Department of Surgery, and the Director of Biomedical Communications in the Institute of Communication and Culture at University of Toronto.

In 2005, Linda became a Fellow of the Association of Medical Illustrators (AMI), “for her significant contributions to the success and vitality of the AMI through exemplary participation and service.” During the 26 years that she has been an AMI member, she has served as Chair of the AMI Council on Education, a Member of the Journal of Biocommunication (JBC) Editorial Review Board, a Trustee of the Vesalius Trust (an international non-profit organization for the enhancement of research in Biomedical Communications), and recently, the most active member of the AMI Sponsorship Committee. Linda has just completed a 3-year term as President-Elect, President, and Immediate Past President of the AMI.

In 2008, Linda received one of the AMI’s highest awards: The Brödel Award for Excellence in Education. She has received two literary awards from the JBC and in 2005, received a special recognition award for her contribution to this peer-reviewed Journal.

Linda is dedicated to creating new knowledge in her discipline, especially in the area of enhanced discovery through visualization. She is the first co-author and sole illustrator of Cranial Nerves (now in the 3rd edition, PMPH publisher) and Autonomic Nerves (B.C. Decker, publisher). From 2002-2008, Linda was a co-applicant on a Canadian Institute of Health Research (CIHR) National Training Program Grant, “Pain Research from Molecules to Community”. Since 2008, she has continued to work with her colleagues in the “Quebec Pain Research Network.”

In Grenada, Linda will reflect on her experiences regarding how to align an organization to achieve the best possible outcome and how to weather change and get things done in academia. In her experience, collaboration between colleagues and allied professional organizations opens doors to enhance emerging opportunities.
Honored Member, 2012

Dr. Ronald A. Bergman, Ph.D.

Dr. Ronald A. Bergman is Professor Emeritus of Anatomy and Cell Biology at the University of Iowa College of Medicine and Honorary Editor of the International Journal of Anatomical Variations. Dr. Bergman grew up in Chicago and earned BS (biology), MS (physiology and zoology), and PhD (Marine Biology, 1955) degrees from the University of Illinois. He did postgraduate work as a National Foundation for Infantile Paralysis Fellow at the Karolinska Institute in Stockholm, Sweden. Following his work in Sweden, he was offered a position in the Poliomyelitis Laboratory in the School of Hygiene at The Johns Hopkins Medical Center by David Bodian, a distinguished polio researcher. When Dr. Bodian was appointed Head of the Department of Anatomy at Johns Hopkins, Dr. Bergman was asked to join him. There, Dr. Bergman continued his bench research in muscle biology and was assigned to teach gross anatomy. By Dr. Bergman’s own admission, he did not know enough anatomy “to stuff a pocket” and that his knowledge of the subject he was to teach was “pitiful.” Despite his early humiliation and frustration as an instructor, he exemplified the contemporary attribute of “lifelong learning” and developed preeminence in the discipline.

In 1974 Dr. Bergman went to the American University of Beirut where he was Professor in the Department of Human Morphology until 1980. During that time, he and his colleagues held the medical school together while civil war raged in Lebanon. For his valiant work, he was awarded the Gold Order of Merit medal by the Lebanese Government. In 1980 Dr. Bergman moved to the Department of Anatomy at the University of Iowa where he taught gross anatomy and histology to hundreds of medical students before retiring in 1997. He is the author of 66 papers and more than a dozen books and chapters, including texts on MRI and CT Sectional Anatomy. He directed the thesis work of several graduate students and supervised postdoctoral fellows and was the recipient of numerous teaching awards, and research and education grants.

Over the course of 35+ years, Dr. Bergman methodically perused a total of 884 research journals (every English journal and a multitude of foreign journals as well) and each page from their inception and catalogued human anatomic variations. From this work he published the Compendium of Human Anatomic Variation: Text, Atlas, and World Literature (1988) and Illustrated Encyclopedia of Human Anatomic Variation (1996). In 2006, he and his associates made these and other resources available as an online anatomy health sciences library, the Anatomy Atlases (www.anatomyatlases.org), for use by medical students, residents, other health care providers, and patients. In 2011, this website had nearly 4 million pages read by 1.2 million visitors representing 560 gigabytes of data transferred! These resources are the “crown jewel” of Dr. Bergman’s professional career.

A quote from Sir William Osler on the website reads, “Variability is the law of life, and as no two faces are the same, so no two bodies are alike.” This personifies what Dr. Bergman clearly saw and spent a career responding to in the anatomy lab and in the literature. As anatomists and clinicians, we are deeply indebted to Dr. Bergman’s determined pursuit to document and illustrate human anatomic variations and we are beneficiaries of his incredible scholarship. The next time we think we have discovered something “new under the sun” in the lab, we might wish to first check with the “Father of Human Anatomic Variations.” The AACA is very pleased and honored to recognize Dr. Bergman as this year’s Honored Member.
Previous Honored Members of the AACA

*W. Henry Hollinshead, 1984
*Chester B. McVay, 1985
*Donald James Gray, 1986
*Russell T. Woodburne, 1987
*Oliver Beahrs, 1988
N. Alan Green, 1989
*Frank H. Netter, 1990
*Ralph Ger, 1991
M. Roy Schwartz, 1992
Carmine D. Clemente, 1993
Keith L. Moore, 1994
*Ray J. Scothorne, 1995
Robert A. Chase, 1996
Tatsuo Sato, 1997
*John E. Skandalakis, 1998
Donald R. Cahill, 1999
*Sandy C. Marks, Jr., 2000
David G. Whitlock, 2001
Robert D. Acland, 2002
Arthur F. Dalley, II, 2003
*John V. Basmajian, 2004
Ian Whitmore, 2005
Peter H. Abrahams, 2006
Gary G. Wind, 2007
Vid Persaud, 2008
Richard S. Snell, 2009
Ray Gasser, 2010
Harold Ellis, 2011

* deceased
R. Benton Adkins Jr. Distinguished Service Award, 2012

Keith L. Moore, Ph.D., D.Sc., FIAC, FRSM

Dr. Keith Moore has a rich and longstanding history with our Association. He was one of our Founding Members, President of the AACA (1989-1991), Honored Member (1994), Associate Editor of Clinical Anatomy since 1986, and has served on several AACA committees. He created the Keith L. Moore/Lippincott, Williams and Wilkins Presidential Address Award in 2004 and provides support for The Keith and Marion Moore Blue Box Award, which recognizes the best student publication annually in Clinical Anatomy. Dr. Moore is Professor Emeritus of Anatomy and Cell Biology, Faculty of Medicine, University of Toronto, Toronto, Canada. Prior to his retirement in 1991, he was Chair of Anatomy (1976-1985) and Associate Dean of Basic Medical Sciences (1985-1990). Before arriving at the University of Toronto, he was Professor and Head of the Department of Anatomy (1965-1975) at the University of Manitoba, Canada, where he rose through the academic ranks. Dr. Moore has published 60 scientific papers, including seminal work on sex chromatin patterns in nuclei of various human and animal cells that led to the development of the buccal smear sex chromatin test (1965) for the clinical determination of gender in management of human intersexuality and for detection of numerical chromosomal abnormalities. This laboratory test is still used today.

Dr. Moore has had a worldwide impact on the human anatomy education of medical students and residents through his popular textbooks on gross anatomy and embryology, which have been translated into several languages. These include, Clinically Oriented Anatomy, Essential Clinical Anatomy, The Developing Human, Before We Are Born, and Color Atlas of Clinical Embryology. For his outstanding contributions in the discipline of anatomy, he has received numerous awards, fellowships, and memberships from, among others, the American Medical Writers Association, American Association of Anatomists, University of Costa Rica, and Italian Society of Anatomy and Histology. He was recently awarded an honorary Doctor of Science from The Ohio State University. He has provided continuous and enthusiastic support for the next generation of clinical anatomists and we thank and honor him for the dedicated and distinguished service he has provided over his career to the AACA.
Previous R. Benton Adkins Jr. Distinguished Service Award Recipients

2004 - Robert J. Leonard
2006 - Daniel O. Graney
2007 - Ralph Ger
2009 - Arthur F. Dalley
2011 - Carol Scott-Conner
Post Graduate Course

“ANATOMY and ULTRASOUND”

At The St. George’s University School of Medicine

Course Directors: Marios Loukas, M.D., Ph.D., Kitt Shaffer, M.D., Ph.D., and Robert Ward, M.D.

Course Objectives: Introduce Clinical Anatomists to ultrasound procedures that enhance anatomy education, clinical diagnosis, and research. The course will provide the opportunity for attendees to perform and interpret basic ultrasound examinations of parts of the respiratory, cardiovascular, gastrointestinal, and musculoskeletal systems. These exercises will enable the attendee to identify anatomical landmarks that correlate with various clinical conditions. The course will offer hands-on experience using ultrasound devices on dissected cadaveric specimens and both standardized and real patients.

The course will help anatomists address the following questions:

- Should the growing use of ultrasound in emergency medicine, radiology, and internal medicine modify the way in which anatomy is taught in the future?
- Is there a place for ultrasound in the anatomy curriculum?

Course Outline

7:30 - 8:00 Registration & Continental Breakfast
8:00 - 8:30 Overview of Ultrasound in Anatomy
8:30 - 9:00 The History of Ultrasound and its Involvement in Clinical Medicine
9:00 - 9:30 Ultrasound Physics
9:30 - 10:00 Break
10:00 - 10:20 Ultrasound of the Upper Limb
10:20 - 11:00 Hands-on Experience Lab
11:00 - 11:20 Ultrasound of the Lung
11:20 - 12:00 Hands-on Experience Lab
2:10 - 2:40 Ultrasound of the Abdomen
2:40 - 3:30 Hands-On Experience Lab
3:30 - 4:00 FAST (Focused Assessment with Sonography for Trauma) Examination Lab
4:00 - 4:30 General Discussion on the Educational Value of Ultrasound in the Anatomy Curriculum
Anatomical Services Committee Symposium

Co-Moderators:

Tom Gest
Professor
University of South Florida

Brandi Schmidt
Director, Anatomical Services
University of California, Office of the President

Charlotte Wacker
Director, Donated Body Program
University of California, Davis

Outreach and Stewardship in Academic Whole Body Donation Programs

This symposium will introduce outreach strategies and marketing concepts that guide the operation of an academic whole body donation program through its community interactions. The symposium will also include small group breakout sessions and whole group discussion.

Tracy B. Bryan, APR

Tracy Bryan is the Director of Public Relations for Sierra Donor Services, the nonprofit organ and tissue donor recovery agency serving nearly four million people in Northern California and Nevada. She is also the Immediate Past President of the Donate Life California Organ and Tissue Donor Registry. As one of the Registry’s founders, she took a lead role helping to develop, draft, and implement law to establish the Registry. She is now a Board Member for Donate Life California, on the Association of Organ Procurement Organizations (AOPO) Public Education Committee, and is an accredited member of the California Capital Chapter of the Public Relations Society of America. Prior to joining GSDS, Ms. Bryan was an award-winning broadcast news reporter for KCRA Channel 3 in Sacramento.
Educational Affairs Committee Symposium

Co-Moderators:

Noelle Granger, Ph.D.
Professor Emeritus
University of North Carolina School of Medicine

Peter Ward, Ph.D.
Associate Professor
West Virginia School of Osteopathic Medicine

Anatomy Throughout the Curriculum: What to Teach and When

Lawrence Rizzolo, Ph.D.

*How to plan out a four-year curriculum by working backwards*

Lawrence Rizzolo, Ph.D., is an Associate Professor of Surgery at the Yale University School of Medicine, New Haven, CT. He directs the anatomy course for first year medical students and is the Director of Medical Studies for the Section of Anatomy. Dr. Rizzolo serves as a liaison for education between the American Association of Anatomists and the Anatomical Society of Great Britain and Ireland. He edits Anatomy Clinic, a web-based dissector that is based on common clinical cases and procedures. He has research programs in curricular development and in retinal cell biology.

Ameed Raoof, M.D., Ph.D.

*Updating gross anatomy student resources to better align with a distributed anatomy discipline*

Ameed Raoof, M.D., Ph.D., is an Assistant Professor of Anatomy and Medical Education and Director of the Division of Anatomical Sciences at the University of Michigan Medical School. Dr. Raoof also serves as the M1 Anatomy Coordinator and the Director of the Plastination Lab for the Department of Medical Education. In July 2011 at the International Society for Plastination Interim Meeting in Toledo, Ohio, Dr. Raoof delivered a platform presentation on anatomy education using plastinated specimens at the University of Michigan. In April 2011 he was the invited Keynote Speaker at Dalhousie Medicine New Brunswick, on the Saint John Campus in New Brunswick, Canada where he presented a workshop on best practices in anatomy education. Dr. Raoof was recently awarded the Thomas G. Varbedian Award for Excellence in Service to Students from the University of Michigan Medical School.
Anne M. Gilroy, M.A.

Can a Longitudinal Program Rescue the New Curriculum?

Anne M. Gilroy is an Associate Professor of Clinical Anatomy in the Departments of Surgery and Cell Biology at the University of Massachusetts Medical School. She earned her Masters of Arts degree in Biology at San Jose State University in California where she studied wildlife biology. She worked on a variety of wildlife projects for the California Fish and Game Department, the National Wildlife Service, and the National Parks service before joining the teaching faculty of Worcester State College in Massachusetts in 1985.

Since joining UMMS in 1989, she has created a longitudinal program in clinical anatomy that includes anatomy programs for students at all levels of training and specialty courses for medical residents in plastic surgery, anesthesia, and Ob/Gyn. In 2008 she co-authored the Atlas of Anatomy, a text designed for use in medical gross anatomy programs. Anne has been recognized for her commitment to medical education by receiving an Outstanding Medical Educator Award annually since 1994, the Educational Achievement Award in 2005, and the Lamar Soutter Award for Excellence in Medical Education in 2009 at UMMS.

Arthur F. Dalley, II, Ph.D.

Brave New World: An Attempt to Leave Flexner Behind

Art Dalley is a Professor in the Department of Cell and Developmental Biology and directs Medical Gross Anatomy and the Anatomical Donations Program at Vanderbilt University School of Medicine. Dr. Dalley has been the recipient of numerous student and peer teaching awards, was elected to the Alpha Omega Alpha Medical Honor Society and the Vanderbilt Academy for Teaching Excellence, and was recognized as a Master Basic Sciences Teacher. In 2004, he received the American Association of Medical Colleges/Alpha Omega Alpha Robert J. Glazer Distinguished Teacher Award.

Dr. Dalley has also co-authored numerous anatomical textbooks and atlases, most notably Clinically Oriented Anatomy, Essential Clinical Anatomy, Grant’s Atlas of Anatomy, Dynamic Human Anatomy, and was Consulting Editor for the Frank H. Netter M.D. Atlas of Human Anatomy (2nd ed.). Dr. Dalley is also a founding member of the AACA and over the years has held virtually every elected office within the Association, including President. He received the AACA’s two highest recognitions: the Honored Member Award and the R. Benton Adkins Jr. Distinguished Service Award and recently served as a member of the committee formulating the 2009 Joint Report of the American Association of Medical Colleges and the Howard Hughes Medical Institute, “Scientific Foundation for Future Physicians.”
Career Development Committee Symposium

Moderator:

Brion Benninger, M.D., M.S.
Department of Surgery
Oregon Health Sciences University

Pearls of Teaching in Current Clinical Anatomy

Within this symposium, a cadre of health care professionals will highlight the dynamics of clinically relevant anatomy. The panel of speakers will present on their anatomical region of expertise, highlighting anatomical structures that are clinically relevant to their discipline. Specifically, these experts will focus on the evolution of structures as new clinical approaches have brought them from less to paramount importance. Speakers are from a range of disciplines and will provide educational pearls of teaching to bring their expertise from the bedside to the classroom.

Joshua Stefanik, MSPT, PhD

The Patellofemoral Joint: The Forgotten Joint in Knee Osteoarthritis

Joshua Stefanik, MSPT, PhD, is a Postdoctoral Fellow in the Clinical Epidemiology Research and Training Unit at Boston University School of Medicine. He has 10 years of clinical experience as a Physical Therapist and has recently turned his attention to teaching in the anatomical sciences and conducting clinical research. His research interests include identifying the pathophysiology, risk factors, and treatments for patellofemoral joint osteoarthritis. The patellofemoral joint is the “forgotten” joint in knee osteoarthritis and his presentation will discuss evidence on why it should not be overlooked in medical education, research, and treatment of individuals with knee osteoarthritis.

Stefani VanderMeulen, MPAS, PA-C

The Role of the Capsule and Glenohumeral Ligaments in Shoulder Instability

Stephane VanderMeulen, MPAS, PA-C, received her Bachelor of Science degree in Biology/Life Sciences from Wayne State College and a Master of Physician Assistant Studies from the University of Nebraska Medical Center in Omaha, Nebraska. After working in Family Medicine in rural Nebraska for a short period, she began her career in Orthopedic Surgery/Sports Medicine in 1996, with an emphasis in shoulder and upper extremity surgery. She is currently an Assistant Professor and Academic Coordinator at the University of Nebraska's Physician Assistant program. Ms. VanderMeulen serves as
Director at Large on the Board of Directors of the Physician Assistant Education Association and is an active advocate for her profession at both the state and national levels.

Lonie Salkowski, MD

Taking Anatomy to the View Box and Patient

Dr. Lonie Salkowski received her medical degree from the Medical College of Wisconsin (MCW), Milwaukee, WI in 1991. She began her academic career in radiology at MCW in 1998. In 2011, became a Professor in Radiology at the University of Wisconsin School of Medicine & Public Health (UW). In 2007 received an affiliate appointment in the UW Department of Anatomy and in 2009 the Medical Advisor for the UW School of Radiology Technology. She has been teaching students radiologic anatomy for over 10 years and this year received the 2011 Dean’s Teaching Award. She is currently the Chief of Breast Imaging at UW hospital and clinics.

Brion Benninger, MD, MS

Dynamic Clinically Relevant Structures and Positions Versus Classic

Dr. Brion Benninger received his medical degree in 1991 from the University of Leicester Medical School, England. His surgical residency training included clinical anatomy mentoring from Sir Harold Ellis at Guy’s Hospital, London. His surgical training focused on trauma and soft tissue injuries. He received a Masters in Sports Medicine from the University of Nottingham Medical School in 1997. He invented the shoulder proprioception machine andbetween 1997-2000 as part of theSports Medicine faculty, taught clinical anatomy to surgeons, osteopaths, chiropractors, and physical therapists. He also served as British Olympic Association Sports Medicine Physician. He accepted an appointment at Oregon Health & Science University in 2000 and to date has taught clinical anatomy to surgical specialty residents, medical, dental, physician assistant, radiation therapy, and graduate students. He has received teaching awards in the UK, US, and the Caribbean. He is the only anatomist to be honored as the ‘White Coat’ ceremony instructor at OHSU. He started the Clinical Anatomy Research (CAR) Society of Oregon, aimed at improving the overall standard of anatomy at K12, undergraduate and postgraduate healthcare institutions. For 2011/12 he received the Commendation Award for Anatomy teaching excellence from Western University Health Sciences, COMP-Northwest, and served as an external examiner for Masters and PhD Anatomy degree candidates. His anatomy interests are core concepts, alternative teaching of anatomy, terminology and reverse translational research.
Poster Listing
Poster Session 1 - Tuesday July 10 12:00 – 2:00

Back

The structure of the posterior ramus of the lumbar spinal nerve. SAITO, Toshiyuki, Hanno STEINKE, Takayoshi MIYAKI, Shiro NAWA, Kanae UMEMOTO, Takashi NAKANO, and Kem ASAMOTO. Department of Anatomy, Aichi Medical University, Japan.

Fascia superficial to the longissimus thoracis muscle -- a pilot study. WARD, Peter J. West Virginia School of Osteopathic Medicine. Lewisburg, WV 24901, USA.

Anatomy relevant to neonatal caudal and lumbar epidural anaesthesia. BOSMAN, Marius C.1, Albert-Neels VAN SCHOOR2, and Adrian T. BOSENBERG2. 1Department of Anatomy, University of Pretoria, Pretoria, South Africa; 2Department of Anesthesiology, Seattle Children’s Hospital, Seattle, WA 98105, USA.

Mapping the contributions of the furcal nerve. HILLMAN, Daniel, Theofanis KOLLIAS, Robert G. LOUIS Jr, Anthony V. D’ANTONI, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (MARKS)

Upper Limb

Three dimensional anatomical study of the thoracodorsal nerve and artery. TAKAHASHI, Takahashi1, Koichi WATANABE1, Tsuyoshi SAGA1, Moriyoshi NAKAMURA1, Koh-ichi YAMAKI1, Noriyuki KOGA2, Hideaki RIKIMARU2, and Kensuke KIYOKAWA2. 1Department of Plastic and Reconstructive Surgery and Maxillofacial Surgery, Kurume University School of Medicine; 2Department of Anatomy, Kurume University School of Medicine, Asahimachi 67 Kurume City, Fukuoka Prefecture, Japan.

Intra-ligamentous blood supply of the superior glenohumeral ligament: A histological study. POLDOJA, Elle1, Joel DAVIES2, Tibor BULECZA1, Ege JOHANSON1, and Ivo KOLTS1. 1Institute of Anatomy, University of Tartu, Estonia and 2Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, CA. (MARKS)

Head/Neck

Spatial relations among the muscles at the boundary region between the oral cavity and the pharynx. SAKAMOTO, Yujiro. Tokyo Medical and Dental University. Tokyo 113-8549, Japan.

Technique for improved dissection of the middle ear. WEINHAUS, Anthony J., Aaron J. Henderson, and Mark S. COOK. Department of Integrative Biology and Physiology, University of Minnesota, Minneapolis, MN 55455, USA.
Redefining Pitanguy's Line: A three-dimensional analysis of the fronto-temporal branch of the facial nerve. DAVIES, Joel C., Adel FAITAHER, Mayoorendra RAVICHANDIRAN, and Anne AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CA. (MARKS)

A volumetric study of the mandibular canal in dentulous patients using cone beam computed tomography. LOMAS, Eric M. and Neil S. NORTON. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE 68178, USA. (MARKS)

Thorax

A classic case of oat-cell carcinoma of the lung: Anatomic and histologic presentation with current therapeutic approaches. MATUSOV, Yuri, Benjamin C. HUGO, Vicente VAZQUEZ, Trushar RATHOD, and Kristjan L. THOMPSON. Ross University School of Medicine, Portsmouth, Dominica, West Indies.

High take off coronary arteries and its potential association with sudden cardiac death. RICCARDI, Rachel, Sinziana MAHALEN, Theofanis KOLLIAS, Kathleen BUBB, Benjamin TURNER, Michael SNOSEK, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies. (MARKS)

Determining airway acid production in living cells in vitro using confocal microscopy. LEWIS, C. C., and H. FISCHER. 1Samuel Merritt University, Oakland, CA 94609, USA, and 2Children’s Hospital Oakland Research Institute, Oakland, CA 94609, USA.

Education

Perspectives on an inquiry-based learning strategy designed for a large-scale human anatomy course. LEE, Francisco, Lauren ANSTEY, and Les W. MACKENZIE. Department of Biomedical and Molecular Sciences, Queen’s University, Kingston, ON K7L 3N6, Canada. (MARKS)

Changes in critical thinking vs. performance of medical students progressing through gross anatomy. NEWTON, Bruce W. and Kevin D. PHELAN. Department of Neurobiology and Developmental Sciences, College of Medicine, University of Arkansas for Medical Sciences, Little Rock, AR 72205, USA. (MARKS)

Training human anatomy teachers: An educational track master’s degree program in anatomical sciences. MACKENZIE, Les W., Ron EASTEAL, Stephen C. PANG, and Conrad REIFEL. Department of Biomedical and Molecular Sciences, Queen’s University, Kingston, Ontario, Canada K7L 3N6.

Lower Limb

Variant leg muscles associated with the ankle joint: Clinical implications and photographic evidence. LAMBERT, H. Wayne, Jacob N. FOX, Stavros ATSAS, Sean C. DODSON, Blake T. DANAY, Patrick M. KENNEDY, and Heather J. BILLINGS. West Virginia University, Morgantown, WV 26506, USA.
Three-dimensional architecture of the plantar intrinsic muscles of the foot. ARAKAWA, Takamitsu¹,³, Zhi LI¹, Robert BOBOTSIS¹, Dongwoon LEE², and Anne AGUR¹. ¹Department of Surgery, and ²Computer Science, University of Toronto, Toronto, ON, M5S 1A8, CA. ³Kobe University Graduate School of Health Sciences, Kobe, 654-0142, JAPAN.

A quantification of the musculotendinous architecture of piriformis and its relationship to the sciatic nerve: a 3D modeling study. PARENTE, David N.¹, Shannon L. ROBERTS¹, Oonagh H. SCALLAN¹, Philip A. FABRIZIO², Richard CLEMENTE³, and Anne M. AGUR¹. ¹Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON M5S 1A8, Canada. ²Department of Physical Therapy, College of Pharmacy and Health Sciences, Mercer University, Atlanta, GA 30341, USA. ³Department of Physical Therapy, John G. Rangos Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA 15282, USA. (MARKS)

Anatomic and histologic study of variations in the deltoid ligament of the ankle. PANCHANI, Prakash¹, Todd M. CHAPPELL¹, Garrett D. MOORE¹, R. Shane TUBBS², Mohammadali M. SHOJA², Marios LOUKAS³, Piotr B. KOZLOWSKI⁴, Khurram H. KHAN⁵, Anthony C. DILANDRO⁶, and Anthony V. D’ANTONI⁶. ¹New York College of Podiatric Medicine, New York, NY 10035, USA; ²Pediatric Neurosurgery, Children’s Hospital, Birmingham, AL 35233, USA; ³Department of Anatomical Sciences, St. George’s University, Grenada; ⁴Touro College of Osteopathic Medicine, New York, NY 10027, USA; ⁵Division of Clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035, USA; ⁶Division of Pre-clinical Sciences, New York College of Podiatric Medicine, New York, NY 10035, USA.

Variations in sacral nerve root anatomy and their relationship to piriformis: a 3D modeling study. ROBERTS, Shannon L.¹, David N. PARENTE¹, Oonagh H. SCALLAN¹, Philip A. FABRIZIO⁵, F. Richard CLEMENTE³, and Anne M. AGUR¹. ¹Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON M5S 1A8, CA. ²Department of Physical Therapy, College of Pharmacy and Health Sciences, Mercer University, Atlanta, GA 30341, USA. ³Department of Physical Therapy, John G. Rangos Sr. School of Health Sciences, Duquesne University, Pittsburgh, PA 15282, USA. (MARKS)

Intramuscular innervation: A methodological approach using digitization and 3D modeling of three different muscles. CASTANOV Valera¹, Jason HERMENEGILDO¹, Kajeandra RAVICHANDIRAN¹, Eldon LOH², Nancy MCKEE¹, and Anne AGUR¹. Department of Surgery¹, University of Toronto, Toronto, ON M5S 1A8 and Department of Physical Medicine and Rehabilitation², University of Western Ontario, London, ON N6A 3K7, CA. (MARKS)
Poster Listing

Poster Session 2 - Wednesday July 11 12:00 – 2:00

Upper Limb

Intramuscular compartmentalization of the subscapularis based on neuromuscular innervation patterns. CHANG, Youjin¹, Julia WARDEN², Shannon ROBERTS¹, Ross BAKER¹, Amila SAMARAKOON¹, Chris BOULIAS², Farooq ISMAIL², and Anne AGUR¹. Divisions of Anatomy¹ and Physiatry,² Faculty of Medicine, University of Toronto, Toronto, ON, M5S 1A8, Canada. (MARKS)

Neuromuscular partitioning of supraspinatus: an anatomical study. HERMENEGILDO, Jason¹, Kajeandra RAVICHANDIRAN¹, Eldon LOH², Nancy MCKEE¹, and Anne AGUR¹. Department of Surgery¹, University of Toronto, Toronto, ON, M5S 1A8, CA; and Dept. of Physical Medicine and Rehabilitation², University of Western Ontario, London, ON, N6A 3K7, CA. (MARKS)

Regional specific strengthening of infraspinatus: a review of the literature. ROBINSON, Trevor, Ross BAKER, and Anne AGUR. Division of Anatomy, Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CA.

An ultrasonographic identification of the posterior interosseous nerve for identification of posterior interosseous neuropathy. WEAR, Christopher, Danny BURNS, Deon FORRESTER, Ewarld MARHSALL, Anthony V. D’ANTONI, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (MARKS)

Head/Neck

Anatomic variability of the external larynx and related structures. MONTANTE, James¹, Mary BEE¹, Emily KOETTERS¹, Kevin KALNASY¹, and Allison DIVEN¹. ¹Biology Department, University of Detroit Mercy, Detroit, MI 48221, USA; ²School of Medicine, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. (MARKS)

A new ultrasonographic identification of the recurrent laryngeal nerve - a feasibility study. MARGARIT, Georgiana, Dan HILLMAN, Danny BURNS, Robert HAGE, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (MARKS)

Anatomy of the facial nerve branch to corrugator supercillii muscle. LEE, Hye-Yeon, Young-Chun GIL, Hyejin CHO, Jeong-Doo JIN, and Hee-Hun YANG. Yonsei University Medical College, Seoul 120-752, Korea.

Anatomy of the transplanted heart. FRANCISCO, M., C. ANTUNES, M. COSTA, and T. BARROS. Faculdade de Medicina de Lisboa, Lisbon, Portugal.
An ultrasonic identification of the variations of the internal jugular vein. ROBERTS, Wallisa, Danny BURNS, Mathangi GILKES, Abhishek YADAV, Eric KOPPELMAN, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (MARKS)

Surgical anatomy of the cardiac lymphatic system. FRANCISCO, M., C. ANTUNES, M. COSTA, T. BARROS. Faculdade de Medicina de Lisboa, Lisbon, Portugal.

Locating the tip of the endotracheal tube in the trachea. FOLGER, Walter H., Nancy WILSON-MARTINO, Anne GREGOIRE, and Shea BEARD. Albany Medical College, Albany, NY 12208, USA. (MARKS)

Transverse pericardial sinus: normal or pathologic? An anatomical CT approach. FOLTERMAN, Chris, Anna ŻURADA, Denzil ETIENNE, Jerzy GIELECKI, Maciej MICHALAK, Ewa KUCHARCZYK, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. (MARKS)

**Education**

Modeling muscle attachments with felt: engaging students with an active learning strategy. MONTANTE, James¹, Mary BEE¹², ¹Biology Department, University of Detroit Mercy, Detroit, MI 48221, USA; ²Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. (MARKS)

Cadaver dissection videos: a comprehensive preparatory tool for the anatomy lab. MONTANTE, James¹, M. BEE¹², and R. MCAULEY¹. ¹Biology Department, University of Detroit Mercy, Detroit, MI 48221, USA; ²Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. (MARKS)

Teaching with Twitter: a meaningful way to incorporate microblogging into anatomy instruction. MACPHERSON, Brian, Nicole HERRING, Kendall GAULT, and Jennifer BRUECKNER-COLLINS. Louisville, KY 40299, USA.

Students’ experience and expectations for e-learning: online histology course design. LEE, Lisa M.J., Michael H. HOLLER, Po-Yin YEN. The Division of Anatomy, The Ohio State University, Columbus, OH 43210, USA.

Integrated longitudinal cases in medical curriculum: An example case of hepatocellular carcinoma. POZNANSKI, Ann. Department of Pathology, University of Michigan, Ann Arbor, Michigan 49109, USA and Department of Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, Michigan 48309, USA.

The arduous journey to find a portrait of Beauchene fils: a famous anatomist and surgeon. SPINNER, Robert J. and Alexandra P. WOLANSKYJ. Mayo Clinic, Rochester, MN 55905, USA.
Lower Limb

Novel femoral artery terminology: Integrating anatomy and clinical procedures leading to standardized intuitive nomenclature. BENNINGER, Brion1-8. Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon, OR; Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon and Corvallis, OR. Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA.

An endoscopic and ultrasound approach to the valves of the femoral veins. DELCASTILLO, Estevan, Allysha PRIOR, Timothy ROACH, Michael SNOSEK, Rachel GEORGE, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George’s, Grenada, West Indies. (MARKS)

Piriformis syndrome: Implications of anatomical variations, diagnostic techniques, and treatment options. BUBB, Kathleen, Lindsey CASSIDY, Andrew WALTERS, Mohammadali M. SHOJA, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George’s, Grenada, West Indies. (MARKS)

Accessory navicular bone; clinically useful during first year anatomy. BENNINGER, Brion1-7 and Taylor DELAMARTER1. Departments of Medical Anatomical Sciences1 and Family Medicine2, COMP-Northwest, Western University of Health Sciences Lebanon, OR. Orthopaedics3 and General Surgery4, Samaritan Health Services, Corvallis, OR. Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6 and Oral Maxillofacial Surgery7, Oregon Health and Science University, Portland, OR 97239, USA.

Age-related decrease in PRG4 and elastin expression in rat tendons. KOSTROMINOVA, Y. Tatiana and Susan V. BROOKS. Indiana University School of Medicine-Northwest, Gary, IN 46409, USA, and University of Michigan, Ann Arbor, MI 48109, USA.
Poster Listing

Poster Session 3 - Thursday July 12 12:00 – 2:00

Upper Limb

Variations in the superficial palmar arterial arch in a South African sample. DU PLESSIS, Maira and Yoganathan CHETTY. School of Anatomical Sciences, Faculty of Health Sciences, University of the Witwatersrand, Johannesburg 2193, South Africa.

A 3D modeling study of the musculotendinous architecture of the distal biceps brachii in humans. ZHENG, Lu, Stanley HUNG, Christine WALTON, Amr W. ELMARAGHY, Kajeandra RAVICHANDIRAN, and Anne AGUR. Department of Surgery, University of Toronto, Toronto, ON, M5S 1A8, CA.

Abdomen

The clinical anatomy of the inferior vena. MARSHALL, Ewarld, Georgios SPENTZOURIS, Mitchel MUHLEMAN, Kitt SHAFFER, R. Shane TUBBS, Jerzy GIELECKI, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies.

Naturally occurring splenorenal shunt. BEST, Irwin M. Emory University Hospital, Atlanta, GA 30322, USA.

Abdominal surface anatomy - have we got it right? MIRJALILI, S.A., S.L. MCFADDEN, B. WILSON, T.M. BUCKENHAM, and M.D. STRINGER. Department of Anatomy, University of Otago, Dunedin, New Zealand.

The left branches of the hepatic portal vein. Study on corrosion casts. MATUSZ, Petru. Department of Anatomy, “Victor Babes” University of Medicine and Pharmacy, Timisoara, Romania.

The topographic anatomy of the right and left inferior phrenic arteries. GURSES, I. Ali, Ozcan GAYRETLI, Aysin KALE, Adnan OZTURK, Ahmet USTA, and Kayihan SAHINOGLU. Istanbul University Istanbul Faculty of Medicine, Department of Anatomy, Istanbul, 34390 Turkey.

Education

Comparison of soft-embalming, low/non-formaldehyde procedures for laboratory instruction in Anatomy. BOAZ, Noel T., Richard SIKON, and Dana SIKON. 1Integrative Centers for Science and Medicine, Martinsville, VA 24112, USA; and Virginia Commonwealth University, Richmond, VA 23284, USA; 2Virginia State Anatomical Program, Office of the Chief Medical Examiner, Richmond, VA 23219, USA.

Danatomy: a digital teaching tool designed to help students learn and review skeletal anatomy. MISKA, Dan L. Department of Neuroscience, Cell Biology and Physiology, Boonshoft School of Medicine, Wright State University, Dayton, OH 45435, USA.
Strategies to increase students’ interactivity in histology laboratory: A new medical school experience. MOHAMMED, K. Khalil and Debbie L. KIRKLEY. College of Medicine, University of Central Florida, Orlando, FL 32827, USA.

Incorporating service learning in the anatomical sciences curriculum. MONTANTE, James1, M. BEE1,2, R. NAZAR1. 1Biology Department, University of Detroit Mercy, Detroit, MI 48221, USA, 2Biomedical Sciences, Oakland University William Beaumont School of Medicine, Rochester, MI 48309, USA. (MARKS)

“Cadaver Camp”: A guided dissection experience for high school anatomy and physiology teachers to promote a deeper understanding of obesity and its impact on human structure. JACKSON, Jon1, Allison MATTHEIS2, Debra INGRAM2, and Murray JENSEN2. University of North Dakota1*, Grand Forks, ND 58202, USA, and University of Minnesota, Minneapolis, MN 55455, USA.

Anatomical considerations of tameshigiri: test-cutting with blades in historical Japan. WARD, Peter J. West Virginia School of Osteopathic Medicine. Lewisburg, WV 24901, USA.

Implementing a Convocation of Thanks to honor donors and increase awareness of the UVM Anatomical Gift Program. GREENE, Sarah. University of Vermont College of Medicine, Burlington, VT 05405, USA.

Peer teaching and learning in anatomy practical classes. LARKIN, Theresa and Gregg ROWLAND. Graduate School of Medicine, University of Wollongong, NSW, Australia.

Neutralization of formaldehyde with monoethanolamine: method and a survey of neutralization in the U.S. GEST, Thomas and Dean MUELLER, Division of Clinical Anatomy, Department of Radiology, University of South Florida Morsani College of Medicine, Tampa, FL 33612, USA, and Anatomical Donations Program, Division of Anatomical Sciences, Department of Medical Education, University of Michigan Medical School, Ann Arbor, MI 48109, USA.

Pelvis/Perineum

Bulbospongiosus muscles and the perineal body in females. AKITA, Keichi, Kumiko YAMAGUCHI, Satoru MURO, Hiroaki TAKEYAMA, Masayo HARADA, and Akimoto NIMURA. Unit of Clinical Anatomy, Tokyo Medical and Dental University, Tokyo 113-8519, JAPAN.

Prostate anatomy: analysis of controversies between anatomists and clinicians leading to improved structural recognition and terminology clarity. BENNINGER, Brion1-7 and Nikolaus MATSLER1. Departments of Medical Anatomical Sciences1 and Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon, OR. Orthopaedics3 and General Surgery4, Samaritan Health Services, Corvallis, OR. Departments of Surgery5, Orthopaedic Surgery and Rehabilitation6 and Oral Maxillofacial Surgery7, Oregon Health and Science University, Portland, OR 97239, USA.
The origin, course and branching pattern of the pudendal nerve in Turkish adult cadavers. GURSES, I. Ali¹, Ozcan GAYRETLI¹, Necdet KOCABIYIK², Aysin KALE¹, Osman COSKUN¹, and Adnan OZTURK*.
¹Istanbul University, Istanbul Faculty of Medicine, Department of Anatomy, Istanbul, 34390 Turkey; ²Gulhane Military Medical Academy, Department of Anatomy, Ankara, 06010 Turkey.
ANNUAL BUSINESS MEETING

AGENDA

Wednesday, July 11, 2012
St. George’s University
Grenada

CALL TO ORDER:  3:45pm

Approval of Minutes of 2011 ABM and the 2012 Agenda

1.  President's Report
   a.  2012 Election Results
   b.  2013 Election
   c.  Presidential Committee Appointments

2.  Treasurer's Report - Neil Norton

3.  Membership Committee Report - Brian MacPherson
   a.  Remembrance of Deceased Members – Wayne Lambert

4.  Journal Committee Report - Brian MacPherson
   a.  Report of Editor-in-Chief - Stephen Carmichael

   b.  Future Meetings:
      i.  30th Annual Meeting 2013, Denver, Colorado – Vic Spitzer

6.  Committee Elections ** - Anne Agur
   a.  Election of Members-at-Large for Bylaws:  2 vacancies
   b.  Financial Affairs Committee:  1 vacancy
   c.  Nominating Committee:  2 vacancies

7.  Old Business

8.  New Business

ADJOURNMENT:  5:15pm

* The membership Special Interest Group (SIG) Committee’s Educational Affairs, Career Development, Clinical Terminology and Anatomical Services elect members at the Committee’s meeting.
2012-2013 Officers of the AACA Council

President - Anne Agur, Ph.D.
President-Elect - Brian R. MacPherson, Ph.D.
Secretary - H. Wayne Lambert, Ph.D.
Treasurer - Neil S. Norton, Ph.D.
Past-President - Todd R. Olson, Ph.D.
Program Secretary - Mark F. Seifert, Ph.D.

Councilors
Brion Benninger, M.D., M.S.
F. Richard (Rick) Clemente, Ph.D., P.T.
Thomas R. Gest, Ph.D.
Carol S. Lomneth, Ph.D.
Marios Loukas, M.D.
Brandi J. Schmitt, M.S.
Kimberly S. Topp, P.T., Ph.D.
David J. Porta, Ph.D.
R. Shane Tubbs, Ph.D.
Peter Ward, Ph.D.
Clinical Anatomy

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

Editor-in-Chief – Stephen W. Carmichael


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BACA Assistant Editor – Stuart W. McDonald
ASSA Editor – Graham Louw
ANZACA Editor – Helen Nicholson
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Marios Loukas
Scott Lozynoff
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Sarah Mackay
Vishy Mahadevan
Pasuk Mahakkanukrauh
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Gary E. Wise
DaChuan Xu
Shao-Xiang Zhang
Changman Zhou
Anna Zurada
Committee Reports

Anatomical Services Committee
Career Development Committee
Clinical Anatomical Terminology Committee
Educational Affairs Committee
Journal Committee
Meeting Oversight and Program Planning Committee
Membership Committee
Nominating Committee
2012 Annual Meeting Committee
Anatomical Services Committee (ASC)

2012 AACA Annual Meeting Anatomical Services Committee events include:

- Members of the Anatomical Services Committee will be present at the Introduction to the AACA breakfast, which takes place on Monday, July 9 at 7 AM. This breakfast will give first time and newer AACA meeting attendees and members a chance to interact with AACA council and committee members, to learn what we do and how to get involved.
- The annual breakfast meeting, which takes place on Thursday, July 12 at 7:30 AM. Among other agenda items, the active AACA members will be voting for a new Anatomical Services Committee member. All meeting attendees are welcome to attend.
- Platform Session 7 on Anatomical Gifts takes place on Thursday, July 12 from 9:00 AM to 10:15 AM.
- The Anatomical Services Symposium takes place on Thursday, July 12, 2011 from 2:00 to 3:30 PM. The topic this year is Outreach and Stewardship in Academic Whole Body Donation Programs. All meeting attendees are welcome to attend.

The Anatomical Service Committee (ASC) represents both academic and technical members of the Association who are active in the operations and administration of institutional whole body donation programs. This special interest group functions to serve the association’s membership through the development of symposia, courses and guidance documents and promotes technical and academic aspects of human anatomical specimen use in health care and university education and research. The group advocates informed, ethical, safe operations for students, faculty and researchers who contribute to medicine, education and research through the use of anatomical materials. The ASC meets throughout the year to discuss and act on relevant items that range from current practices, related legal and media items to pertinent Association bylaws and topics for future symposia. The AACA maintains an active listserv specific to anatomical services, which helps to facilitate open discussion of relevant issues. We use this listserv to raise awareness, communicate with colleagues and to gather information. The ASC regularly interacts with members of other professional societies on topics of mutual interest.

The ASC has authored a document entitled “Best Practices in Whole Body Donation Programs,” maintains contact information for all institutional whole body donation programs nationwide, and disseminates information on access to anatomical materials and related professional aspects of those who work in anatomical services careers.

Please come to the ASC symposium, stop by our breakfast meeting or other events on Thursday or get in touch with one of our committee members to learn more about how this Committee serves the Association and its members. The current ASC committee includes:

Presidential Appointees:

2010-2013: Len Cleary, Academic Co-Chair - Len.Cleary@uth.tmc.edu
2009-2012: Carol Lomneth - clomneth@unmc.edu
2011-2014: Angela McArthur – mcarthur@umn.edu
Elected Members:

2011-2012: Charlotte Wacker – charlotte.wacker@ucdmc.ucdavis.edu
2010-2013: Dean Mueller - deanm@umich.edu
2011-2014: Tom Gest – trgest@gmail.com

Ex Officio:

Brandi Schmitt, Technical Co-Chair, Councilor - brandi.schmitt@ucop.edu
Career Development Committee (CDC)

The Career Development Committee (CDC) is designed to support career growth and the advancement of clinical anatomy knowledge for an individual at any stage of their career. Additionally, the CDC fosters quality anatomical research and scholarly educational work. The committee accomplishes these goals through numerous activities, including: coordinating the judging of student posters (Sandy C. Marks, Jr. Award) and platform presentations (Ralph Ger Award) at the annual meeting, planning and implementing the mentor social at the annual meeting, and planning the annual Career Development Symposium.

Currently, the committee is working to expand the mentor reception into a formal mentor program, where early career anatomists will have the opportunity to be paired with a mentor at the social event. With this event at the beginning of the annual meeting, the mentee and mentor have the length of the meeting to foster a relationship. We hope that this will encourage early career anatomists to network with the plethora of experienced anatomists at, and beyond, the annual meeting.

In addition to the Mentor Reception on Monday evening, please join us for breakfast on Wednesday morning and the Career Development Symposium Pearls of Teaching in Current Clinical Anatomy on Wednesday afternoon. Please contact Rebecca Lufler (Rebecca.lufler@tufts.edu) for more information about the CDC.

Short term plans:

- Work with the Educational Affairs Committee to coordinate complimentary symposia for the 2013 AACA Annual Meeting
- Gather feedback from beta testing the mentor program

Long term plans:

- Continue to develop the mentor program
- Develop the Career Development Symposium for the 2014 meeting

Current Committee Members

Rebecca Lufler, Co-Chair
Brion Benninger, Co-Chair
Anthony Olinger
Sarah Keim-Janssen
Soo Kim
Craig Goodmurphy
Clinical Anatomical Terminology (CAT)

The Clinical Anatomical Terminology (CAT) committee was formed to investigate the usage of anatomical terms and to develop and implement mechanisms by which both clinical and anatomical systems of nomenclature can be cross referenced and discussed in the same widely accessible resource in order to improve the educational experience for students and faculty, and simplify communication between a broad spectrum of medical and allied health professionals and educators. In addition, we aim to promote awareness of the history of anatomical terms and their evolution into the various synonyms used today by anatomists, clinicians, and educators.

CAT committee activities include collecting anatomical terms in use by various constituencies (e.g. anatomists, including FIPAT, clinicians of various specialties, authors) around the world, documenting their usage, and tracing their history. Currently, these activities are channeled into the development of two websites (described below). We also spend time brainstorming about how best to disseminate the information we collect.

Short range plans:
- Continue working with Dr. Paul Gobée to complete the upgrade and wikification of AnatomicalTerms.info by beta testing the site as development progresses. This work is amazing, thought provoking and the essence of collaboration!
- Continue working with Dr. Tom Gest to update his website, Clinical Anatomical Terminology, which he recently moved to sunny Florida. http://health.usf.edu/nocms/medicine/anatomylab/AnatomicalTerminology/
- Complete revision of the first CAT Committee paper and submit additional papers to appropriate journals for publication.

Long range plans:
- Review and contribute to AnatomicalTerms.info and Clinical Anatomical Terminology
- Develop a variety of methods to raise awareness about anatomical terminology
- Develop a symposium for 2013 AACA Meeting

Committee Members 2011-2012

Sherry Downie, Chair
Shane Tubbs (Clinical Councilor) ex officio, Vice Chair
Brion Benninger
Tom Gest
Paul Gobée
Mark Hankin
Todd Hoagland
Brad Martin
Pat Tank
Ian Whitmore
Educational Affairs Committee

The role of the Educational Affairs Committee (EAC) is to present current and developing information about anatomical education and to hold discussions of clinical anatomy teaching and learning that are relevant to members of the AACA. The EAC organizes a symposium focused on anatomy education at the annual meetings. During our monthly meetings our aim is to develop a symposium that encourages conversation between clinicians and anatomists and our anatomical goals in education and research. Our members are asked to focus on topics that can be discussed by experts in our field for immediate implementation by AACA members when then return from the conference. The EAC Committee is in charge of determining their guest speakers, making and maintaining contact throughout the year and planning a budget based on the AACA committee money allotment. This year’s symposium will explore the trials and tribulations of providing students with anatomy content throughout the medical curriculum, while next year in Denver the topic will be the role of assessment across various curricula used in today’s professional programs.

Each annual meeting features an Educational Affairs Breakfast (Tuesday 7am-8am July 10), at which various educational topics are discussed in small groups. The bulk of the business meeting is usually devoted to round table discussions in small groups, focused upon selected topics. This year in Grenada, our focused discussions will look at the following questions: “How do you write clinical vignettes for first year student exams?”; “What current technology platforms do you use in your anatomy lab?”; “How do you present radiology (and how MUCH) in your first year gross anatomy course?”; “What modifications to the “standard” dissection guide does your gross course implement?” and “How do you use ultrasound in your first year gross anatomy course and on your practical exams?” The Educational Affairs Breakfast is the official Educational Affairs Committee meeting at the annual meetings, and an important function of this breakfast meeting is the election of a new member of the Educational Affairs Committee. The EAC holds monthly conference calls to discuss plans for the AACA annual meetings. To date, the EAC has held their conference calls at 4pm EST on the second Tuesday of each month. Current AACA members interested in becoming an elected committee colleague are encouraged to plan for this in advance so that they can attend calls. We encourage all interested AACA members to attend our breakfast meeting and become involved in the discussions and the election.

The current members of the AACA Educational Affairs Committee members are:

Presidential Appointments
Appointee 2010-2013: Rebecca Pratt, Chair
Appointee 2009-2012: Tom Gest
Appointee 2011-2014: Peter Ward, Vice Chair

Members Elected
M-at-L 2009-2012: Noelle Granger
M-at-L 2010-2013: Alena Wade
M-at-L 2011-2014: Ken Jones

When not busy organizing our component of the annual meetings, the EAC is involved in promoting clinical anatomy education through other means, including additions to the AACA web site, such as the Frequently Asked Questions (currently under development), and publishing articles in Clinical Anatomy that address current concerns among anatomy educators.
Journal Committee

In October 2011, the AACA Journal Committee underwent some change in composition to enable more effective interaction with our co-owner of the journal – the BACA. This was to allow us to move ahead with the selection of the next Editor-in-Chief (EIC) for *Clinical Anatomy* while the composition of the Joint Journal Committee of the two associations was being formulated to facilitate a better working relationship with the next EIC. The selection committee for the new EIC was composed of 3 AACA members (Anne Agur, Neil Norton, and Brian MacPherson – Chair of the committee) and 1 BACA member (Heikki Whittet, President).

The Committee met by teleconference and held an interview teleconference with the two finalists for EIC position. The decision of the committee was to appoint Shane Tubbs as our new EIC for the next five year term following the stepping down of Stephen Carmichael at the end of his tenure – scheduled for July of 2013.

Over the next few months, the committee will be hammering out the composition of the Joint Journal Committee, the contract/agreement for the new EIC and the next publisher’s agreement for *Clinical Anatomy*.

Respectfully submitted

Brian R. MacPherson, PhD
Chair, AACA Journal Committee
Membership Committee Report

The AACA Membership Committee (B.R. MacPherson – Chair; T. Olson, and T. Hoagland) are pleased to announce the admission of 88 new members (46 regular; 33 Associate; 5 Affiliate and 4 Senior) since the Annual Meeting in July, 2011 in Columbus through June 1, 2012. These individuals are listed below. Please welcome them if they are in attendance at this meeting.

Regular Members

Abduljabar Yasin Alhubaity, PhD - Mosul Medical College – Iraq
Sanusi M. Bello, PhD, MBBS - University College London – Great Britain
Marcio Babinski, PhD. - Fluminense Federal University – Brazil
Andrew Barnosky, DO - University of Michigan – MI
Scott Barton - University of California, San Diego – CA
Robin Bozarth - Medical Education Research Institute – TN
Teressa Brown, DPT - Simmons College – MA
Lisa Campeau, MD - Louisiana State University – LA
Gary Ciment, PhD - Oregon Health and Science University – OR
Rick Dreiling, PhD - WWAMI Medical Education – WA
Mark A. Erlich, MD - Columbia University College of Physicians & Surgeons – NY
Valéria Fazan, MD - University of Sao Paulo – Brazil
Seth Gardiner, PhD - Bowling Green State University – OH
Sabine Hildebrandt, MD - University of Michigan – MI
Andrew Iakimov, PhD - The Urals State Medical Academy – Russia
Rosalyn Jurjus, MD, PhD - The George Washington University – DC
Daniel J. Livy, PhD - University of Alberta – Canada
Samuel Mandel, MD - Oconee Regional Medical Center – GA
Kiran Matthews, MBBS - Touro College of Osteopathic Medicine – NY
Carol Nichols, PhD - Georgia Health Sciences University – GA
Joseph Opie, MD - Bethel University College of Health Sciences – TN
Lilian Ebele Chris-Ozoko, MBBS - Delta State University – Nigeria
Maira du Plessis, MSc - University of the Witwatersrand – South Africa
Daniel M. Prevedello, MD - The Ohio State University Medical Center – OH
Chantal Previtt, PhD - Bellarmine University – KY
David Rapaport, PhD - University of California, San Diego – CA
David Rodrigouff - Fluminense Federal University – Brazil
Marco de Ruiter, PhD - Leiden University Medical Centre – Netherlands
Chia Saalu, MBCh - Lagos State University College of Medicine – Nigeria
Marin Safaoui, MD - Western University College of Osteopathic Medicine – CA
Kumar Satish Ravi, MBBS - Spartan Health Sciences University – West Indies
Nani Sahayal, CSM Medical University – India
Walaa Sayed, MD - Cairo University – Egypt
Carine Seave, MD - Springfield College – MA
Tracy Soltesz, PhD - Kentucky College of Osteopathic Medicine - KY
Marie E. Stark, MD, PhD – University of California, Los Angeles – CA
Christopher Straus, MD - University of Chicago – IL
Robert A. Sturgeon, MD - All-State Career – PA
Alia Sullivan, BS - Simmons College – MA
Alaba Udoaka, MBCh - University of Port Harcourt – Nigeria
Srikanteswara Viswanath, MBBS - American University of Antigua - Antigua & Barbuda
Alena Wade, MD - St George’s University – Grenada
James R. Wells, MD - University of South Carolina – SC  
Michelle Winfield, MD, DDS - University of Southern California – CA  
Feras Yamin, MBBCh - University of Medicine and Health Sciences – St. Kitts  
Tatheer Zahra, UHS, NUST - Shifa College of Medicine – Pakistan

**Associate Members**

Anthony Aamodt - Logan College of Chiropractic – MO  
Radi Ali M. Al Sa'fear - University of Glasgow – Scotland  
Ryan Casper - Creighton University – NE  
Valera Castanov - University of Toronto – Canada  
Todd Chappell - New York College of Podiatric Medicine – NY  
Hakim Chiali, MD - University or Oran – Algeria  
Blake Daney - West Virginia University – WV  
Julien Diegel - Western University of Health Sciences – OR  
Poldova Elle - University of Tartu – Estonia  
Tulio Fabiano - Gama Filho University – Brazil  
Erin Fillmore - Indiana University School of Medicine – IN  
Sarah Kendall Gault - University of Louisville – KY  
Megan Gray - University of British Columbia – Canada  
Ca'hriona Hastings - Simmons College – MA  
Michael Hollar - The Ohio State University – OH  
John Hulsen, MD - Ohio State University – OH  
Heather King - Saint Louis University – MO  
Alexandra Koba - San Francisco State University – CA  
Samantha Letizio - Simmons College – MA  
Eric Lomas - Creighton University – NE  
Nik Matsler - Western University of Health Sciences – OR  
Yuri Matusov - Ross University School of Medicine – Dominica  
Prakash Panchani - New York College of Podiatric Medicine – NY  
Kevin Post - Oregon Health and Science University – OR  
Ann Poznanski, MD - University of Michigan – MI  
Shannon Roberts - University of Toronto – Canada  
Oonagh Scallan - University of Toronto – Canada  
Samantha Simet, PhD - University of Nebraska Medical Center – NE  
Zain Sohail - University of Toronto – Canada  
Aaron Stecker - Western University of Health Sciences – OR  
Amrish Tiwari, MBBS - SSMC Rewa Madhyapradesh – India  
Kristina Wakimoto, MSc - University of Toronto – Canada  
Lu Zheng - University of Toronto – Canada

**Affiliate**

Mubarak Bidmos, MBBS - University of the Witwatersrand – South Africa  
Marius Bosman, PhD - University of Pretoria – South Africa  
Khalid Mohammed Taha, BSc - Karary University – Sudan  
Richard Tunstall, PhD - University of Nottingham – Great Britain  
Albert van Schoor, PhD - University of Pretoria – South Africa

**Senior**

Suresh Bidarkotimath, MBBS - A J Institute of Medical Sciences – India  
Shyama Chaudhary, MD - Ross University School of Medicine – Dominica  
James Montante, PhD - University of Detroit Mercy – MI  
Sunday Godwin Obaje - Ladoke Akintola University of Technology – Nigeria
Meeting Oversight and Program Planning (MOPP) Committee

The MOPP Committee is responsible for the overall organization, general content, and budget of each Annual Scientific Meeting and Postgraduate Course, and plans and sets the Association’s long-term programmatic objectives for future meetings.

Organizational and planning decisions of the MOPP are implemented through its Annual Meeting Committee structure, and include: preparing the Call for Abstracts, overseeing abstract review, selection, and author notification, organizing the content of platform, techfair, and poster sessions, and meeting program booklet preparation.

The MOPP Committee has met nearly monthly via conference call. Important items discussed or acted upon include:

- Selected Rick Clemente as the 2013 Annual Meeting Chair
- Advanced planning for the 2013 Denver meeting
- Continued communications between AACA and American Medical Illustrators to plan a future co-located meeting
- Potential meeting/destination sites and topics for development into standalone postgraduate courses

The MOPP Committee is comprised of all officers of the Association, the Chairs of the SIG committees, the Chair of each Annual Meeting Committee, and the Local Host for each annual meeting. The Meeting Manager serves as an ex officio non-voting member and the Program Secretary serves as the Chair.

This year’s MOPP Committee members are:

**Executive Committee Members**
- Program Secretary, Mark Seifert
- President, Anne Agur
- Past President, Todd Olson
- President-Elect, Brian MacPherson
- Treasurer, Neil Norton
- Association Secretary, Wayne Lambert

**Special Interest Group Committee Chairs/Co-Chairs**
- Anatomical Services, Brandi Schmitt
- Anatomical Services, Len Cleary
- Career Development, Brion Benninger
- Career Development, Rebecca Lufler
- Educational Affairs, Tom Gest
- Educational Affairs, Rebecca Pratt

**Annual Program Committee Chairs**
- 2012 Program Chair, Bob DePhilip
- 2013 Program Chair, Rick Clemente

**Local Hosts**
- 2011 Columbus, Kenneth Jones
- 2012 Grenada, Marios Loukas
- 2013 Denver, Vic Spitzer
Nominations Committee

Sherry Downie, Chair
Art Dalley
Todd Hoagland
Angela McArthur
Rebecca Pratt

The 2011 Nominating Committee, in fulfilling its charge, met monthly via teleconference from August through November, 2011.

In total, eleven AACA members-in-good standing were considered by the committee as potential candidates for four council positions. These individuals were identified by the committee, presented by the membership, or self-nominated.

The committee submitted a slate of seven outstanding candidates to the Association Secretary. These candidates were individually interviewed by the Nominating Committee chair and all attested to their willingness to be candidates and their commitment to serve on council should they be elected. The slate is listed below.

Due to unforeseen circumstances, two candidates withdrew from the slate prior to the election. The final slate is listed below.

Program Secretary (1 position): Noelle Granger, PhD

Special Councilor - Anatomical Services (1 position): Ms. Brandi Schmitt

Councilor-at-Large (2 positions): Anthony D’Antoni, DC, PhD
Sarah Keim Janssen, PhD
Jonathan Wisco, PhD

The Nominating Committee report was submitted to the Association Secretary by the deadline required in the Bylaws.
2012 Annual Meeting Committee

The 2012 Annual Meeting of the AACA will be hosted by St. George’s University in Grenada. The local host for this meeting is Marios Loukas.

Three features shaped planning for the 2012 meeting. First, because attendees will be housed in student apartments, share meals, and attend scientific sessions on the campus of St. George’s University, there will be many convenient opportunities for chance interaction and informal discussion. In this way, the meeting in Grenada will resemble our meeting in Moraga hosted by St. Mary’s College in 2004. Second, because air travel into and out of Grenada is most accessible on Saturdays, the meeting schedule included four full days of scientific sessions and a fifth day for the Post-Graduate course. This allowed the committee to schedule a larger number of platform presentations than is usual for our meetings. Third, because St. George’s is so close to the equator, daybreak and sunset both occur early, and scheduling for the meeting took the hours of available daylight into account. Specifically, events started early in the morning and ended by early afternoon so that attendees could take advantage of a variety of social events before nightfall and dinner. Other features of this meeting this year:

- The Mentor Reception was moved from its usual position on the evening before the meeting started to the evening of the first full day of the meeting. This change was made to increase attendance at the Mentor Reception.
- All posters will be up and available for viewing for the entire meeting. In addition, the posters will be located in close proximity to the area where attendees will have their meals.
- A “Last Chance” Abstract submission was instituted as an experiment to give attendees a second deadline by which to submit abstracts.
- The activities typically occurring at the Meeting Banquet were separated into two evening events, a Gala Banquet on Wednesday and an Awards Dinner on Thursday. The Gala Banquet will be a more formal affair and include presentation of awards to the Honored Member and the Service Award Member, as well as speeches by the Prime Minister of Grenada and the Chancellor of St. George’s University. The Awards Dinner on Thursday night will be less formal affair highlighting associate members being recognized with the Ralph Ger or Sandy Marks Awards.
- This year, the inaugural Tapan K. Banerji Postgraduate Travel Fellowship Award will recognize a resident, research or clinical fellow, or a young investigator who delivers the best platform presentation will a clear demonstration of clinical significance. A committee chaired by Anne Agur will be formed to evaluate presentations for this award.

The 2012 Planning Committee took advantage of several procedures that had been implemented successfully by previous years’ committees, including the use of telephone conference calls to conduct monthly meetings, the blinded review of all abstracts by an Abstract Review Committee, as formalized by Greg Smith in 2011, and the scheduling of each Special Interest Group meeting and its corresponding symposium on the same day.

We hope and anticipate that the end result of our planning is meeting that is memorable, enjoyable, and intellectually stimulating.

2012 Annual Meeting Chair, Bob DePhilip
2012 Local Host, Marios Loukas
Program Secretary, Mark Seifert
AACA Meeting Manager, Julie Hewett
President, Anne Agur
President-Elect, Brian MacPherson
Treasurer, Neil Norton
2013 Annual Meeting Chair, Rick Clemente
2013 Local Host, Vic Spitzer
Special Interest Group Chairs/Co-Chairs
Anatomical Services, Brandi Schmitt
Anatomical Services, Len Cleary
Career Development, Rebecca Lufler
Career Development, Brion Benninger
Educational Affairs, Rebecca Pratt
Educational Affairs, Peter Ward
Clinical Anatomical Terminology, Sherry Downie
Clinical Anatomical Terminology, Shane Tubbs
Abstracts – Platform Presentations
(listed by presenting author last name)

ACLAND, Robert D.1 and Mark MOBLEY2.1Department of Anatomical Sciences and Neurobiology, University of Louisville School of Medicine, Louisville, KY 40292, USA. 2Warwick Medical School, Coventry, CV4 7AL, UNITED KINGDOM.
Videographic techniques for exploring the inner ear.

INTRODUCTION. The anatomy of the inner ear is exceptionally hard to teach and to learn. The difficulties involve understanding the visible features of the petrous temporal bone, integrating them with the seemingly unrelated shape of the osseous labyrinth, and envisioning the structures inside the labyrinth. It is hoped that a video presentation of these structures, using well established rotational techniques to give a three-dimensional appreciation, will help to alleviate these difficulties. METHODS. A variety of human specimens have been used, including intact skulls, petrous temporal bones (intact, transected and drilled) and fresh tissue micro dissections. To overcome the problem of rotational videography under an immovable microscope, special x-y rotational devices have been developed. A 3D model of the labyrinth was developed, that can be integrated with real video footage. RESULTS. To this point, several sequences have been completed that offer a new insight into the relationship between the visible features of the petrous temporal bone, and the osseous labyrinth. CONCLUSIONS. This presentation will describe a work currently in progress, and will demonstrate videographic techniques that have wider uses for exploring the borderline between gross and microscopic anatomy.

AGGARWAL, Anjali1, Daisy Sahni1, Y. Harjit1, K. Batra2, R. Sondekoppam2. 1Department of Anatomy, 2Department of Anesthesia Postgraduate Institute of Medical Education and Research, Chandigarh, India 160012.
The anatomy of caudal space in fetuses as applied to caudal epidural block.

INTRODUCTION. The caudal epidural space is a popular site for analgesia in pediatrics. High variation in blind needle placement is common during caudal epidurals, increasing the risk of intravascular and intrathecal spread. Knowledge of safe distances and angles for accessing the caudal epidural space in premature infants can improve the safety of caudal epidural blocks. METHODS. Thirty-nine fetuses with crown–heel length between 33 and 50 cm, corresponding to gestational age of 7–9 months, were included. The dorsal surface of the sacrum from the fourth lumbar vertebra to the tip of the coccyx was dissected, following which measurements were taken on dorsal surface and midsagittal sections. The angle of depression of the needle was measured using a goniometer following the two-step method of needle insertion. RESULTS. Right and left sacral cornua were palpable in 23 of 39 fetuses (58.97%). Termination of dural sac was found at varying levels from S1 to S3 (at S2 > S2/S3 junction > S1/S2 junction > S1 > S3). The apex of the sacral hiatus was found at varying levels, at S2 in 23 (58.97%), S3/S4 junction in 7 (17.94%), S4 in 5 fetuses (12.82%) S2/S3 junction in 2 (5.1%), and S2 in 2 fetuses (5.1%). The distance from the apex of the hiatus to the termination of dura ranged from 3 to 13 mm; the anteroposterior distance of the canal at the apex of the hiatus ranged from 1.72 to 4.38 mm. The angle of depression of needle was found to be 77.35 ± 4.70 degrees. CONCLUSION. We recommend not advancing the needle for more than 2 mm after vertically piercing the sacrococcygeal membrane, to align the needle along the canal by depressing the needle by about 75 degrees, and not to insert beyond 3 mm along the sacral canal.
AKITA, Keiichi, Atsushi TASAKI, Akimoto NIMURA, Tomoyuki MOCHIZUKI, Kumiko YAMAGUCHI, Ryuichi KATO, Yoshimitsu HOSHIKAWA, Hiroyuki SUGAYA. Tokyo Medical and Dental University, Tokyo, 113-8519, JAPAN.
An anatomic study of the course of the suprascapular nerve.

INTRODUCTION. Although the direction of the suprascapular nerve is craniocaudal and mediolateral, the morphology of suprascapular notch as possible etiology of the suprascapular nerve entrapment has been estimated by anteroposterior view. The purpose of this study was to investigate anatomic characteristics of the suprascapular nerve course from the suprascapular notch to the spinoglenoid notch along the direction of the suprascapular nerve. METHODS. Fifty embalmed cadaveric shoulders were examined. The morphological features of the suprascapular notch, the supraspinous fossa, and the spinoglenoid notch were observed.

RESULTS. Based on gross anatomic examination, the suprascapular nerve passed anterior to the superior transverse scapular ligament, and the direction of the nerve was nearly parallel to the surface of the superior transverse scapular ligament without any entrapment finding. The inferior transverse ligament was seen in 44 (88%) specimens as oriented loose fibrous tissue. Viewing the direction of the nerve from the suprascapular notch along the supraspinous fossa to spinoglenoid notch indicates the actual running tract of the nerve. CONCLUSION. The nerve tract constructed by several structures that seemed to protect the nerve from the movement of scapula and muscles for the running direction of the nerve. Detailed investigation of the suprascapular notch as the real nerve entrance space along the running direction of the nerve should be significant in terms of understanding the risk of entrapment neuropathy.

ALI, M. Irfan, Ewarld MARSHALL, Benjamin TURNER, Michael SNOSEK, R. Shane TUBBS, Robert H. ANDERSON, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies.
The anatomy of the aortic root.

INTRODUCTION. The aortic root is the anatomical bridge between the left ventricle and the ascending aorta. Its clinical importance stems for its everyday use in aortic valve replacement. METHODS. In this meta-analysis, we describe the anatomy of this crucial cardiac component, emphasizing the problems currently existing due to indiscriminate description of the non-existent annulus. RESULTS. The aortic valve is made up of the aortic valve cusps supported by the aortic sinuses (of Valsalva), with the important fibrous interleaflet triangles interposed between the basal attachments of the leaflets. As such, it possesses significant length, but because of the semilunar attachment of the cusps, there is no discrete proximal border to the root. It is limited distally by the supravalvular ridge (or sinutubular junction). Its description over the years has been bedeviled by accounts of a valvar annulus. There are at least 2 discrete anatomic rings within the root, but neither serves to support the valvar cusps. The essence of the attachments of the cusps is their semilunar hinges, with each cusp extending from distal attachments at the supravalvular ridge (sinutubular junction) to basal ventricular attachments. Of the 3 cusps, 2 are supported basally by ventricular muscle, but the third has an exclusively fibrous base. The root acts as a bridging structure not only anatomically, in that it separates the myocardial and arterial components of the systemic pathway, but also functionally, since its proximal and distal components face ventricular and arterial pressures during life. Although usually describe in terms of possessing an annulus, if translated literally, an annulus is no more than a little ring, and at least 2 such anatomic rings can be found within the aortic root, albeit that neither ring supports the entirety of the hinges of the valvar cusps. When seen in 3 dimensions, the aortic root has a crown-like, rather than a ring-like, configuration. CONCLUSIONS. We submit that future understanding of the structure of the root, a matter of great clinical significance, would be much facilitated if anatomists ceased describing a non-existent aortic annulus.
INTRODUCTION. As in most countries, there is a growing shortage of medical doctors in Israel. This led to two decisions; firstly to open a new medical school and secondly to move from the traditional 6-year program to a 4-year curriculum. The Bar Ilan University Faculty of Medicine opened last October in Safed, Northern Israel. This new school, dedicated to novel but proven teaching methods, enabled us to develop and implement a new anatomy curriculum. METHODS. In the new course we integrated the instillation of anatomical knowledge with clinical exposure from medical educators. RESULTS. The first-year block included the trunk and neck. Each topic had the same structure: we began with basic macro- and micro-anatomy lectures and dissection laboratory, followed by radiology lectures and computer-based imaging laboratories in which the students, under the guidance of a radiologist, practiced structure identification. The next phase comprised clinical lectures, followed by small groups case-based learning, in order to integrate all learned material and develop clinical thinking. Clinical educators were recruited from several affiliated hospitals in Northern Israel, especially the Ziv Medical Center in Safed, where the dissection room is located. Surgical residents performed basic medical procedures in the dissection room, while ENT doctors went over their respective material using real-time laryngoscopy on volunteers. Conclusion. Despite initial problems due to unfinished construction and a heterogeneous student body, the course received excellent feedback from both students and faculty. Among the unique challenges we faced was the necessity to comply with Jewish ethical values, which is especially important as the Bar Ilan University has a dedicated religious philosophy.

BENNINGER, Brion1-8 and William MERBS1. Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon OR, Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon & Corvallis, OR, Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA.

INTRODUCTION. “See one, Do one, Teach one” has been the tried and true axiom for decades. The anatomy dissection lab has the potential to be the medical student’s first exposure to clinically-based learning including critical thinking and exploration. Additionally, dissection can be the initial foray into skills that will later develop into clinical competence. Many anatomists are keen to review a dissection-scoring model, but none formally exist. The objective of this study was to investigate, develop and apply a dissection scoring rubric for future clinicians. METHOD. Literature search was conducted to confirm or deny the existence of a clinically-based evaluation tool for cadaver dissection quality. Development, application and evaluation of a ‘quality dissection’ rubric were conducted during a 10-year pilot study. Rubric was based on clinical skills leading to isolated and/or combined structures, orientation and imaging architecture. Questionnaire was administered to evaluate the rubric. RESULTS. Literature revealed no standardized scoring rubric reported. A 45-point evaluation rubric was successfully developed, implemented and evaluated. DISCUSSION. With resurgence of dissection as a primary mode of anatomy education, there is a need for a clinically based scoring standard that would evaluate, promote and reward student dissection performance. Holding the dissector and teammates responsible for dissection excellence could lead to better orientation and ease of applying anatomy during clinical examinations, imaging, surgery and differential diagnosis. CONCLUSION. This pilot study revealed a successful rubric, evaluating quality dissections, which could lead to accelerated learning in multiple clinical arenas.
INTRODUCTION. The present study was performed because morphometric studies of the FCL are lacking in the literature. METHODS. Blunt and sharp dissection of 74 (N=74) lower limbs was performed to identify FCL bony attachments and variations. A digital caliper was used to measure length, width, distance from distal attachment to articular surface (DA-AS), distance from proximal attachment to articular surface (PA-AS), and distance to common fibular nerve (CFN). Relations of the FCL to the biceps femoris (BF) distal tendon and knee joint capsule (KJC) were recorded. Selected specimens were histologically prepared. In specimens with unique variations (multiple slips), a metal monofilament was adhered to FCLs and radiographed to visualize bony attachments. RESULTS. Mean (SE) age at death of cadavers was 77 (1.5): male (54%), female (46%). Mean (SE) length and width of the FCL in mm was 48 (.76) and 4 (.12), respectively. Mean (SE) DA-AS and PA-AS in mm was 25 (.78) and 22 (.68), respectively. The BF tendon was found superficial and overlapping the FCL 26.2% of the time with great variation. The FCL was attached to the KJC 4.3% of the time. One FCL had distal bifurcate slips and one had distal trifurcate slips. Length decreased with age and DA-AS increased with age. Using linear regression analysis, the PA-AS was not found to be affected by age, sex, limb side, length, and width. However, age, width, and more importantly, length, considerably affected the DAAS and explained about 15% of variability in this distance. CONCLUSION. This study improves our understanding of FCL morphometry and variations, and may provide insight into its age-related changes. Such data may prove useful in treatment of patients with posterolateral corner injury or disease of the knee.

INTRODUCTION. The surgical anatomy of the pelvis is known for its complexity, due to the delicate anatomical arrangement of the internal organs and structures. Surgical procedures pay much attention to the resection of the complete tumor within free circumferential margins together with post-operative functional outcome. Anorectal and urogenital dysfunction, however, occur frequently. Although nerve-sparing radical surgical techniques have reduced post-operative complication rates, damage-controlled surgery still remains challenging and optimal functional outcome is not guaranteed. METHODS. To substantially enrich pelvic surgery, we developed a new surgical planning system that can provide information on the entire pelvic vasculature, autonomic nerves, fascia sheaths and lymphatic drainage pathways. RESULTS. Concerning the pelvis, the usage of the available Visible Human Datasets is limited as a result of the inability to identify and segment detailed pelvic structures. Using Visible Human Datasets as a basic model (e.g. bones, muscles, internal organs) we have generated a comprehensive highly-detailed three-dimensional pelvic computer model. Additional accurate macro- and microscopic immunohistochemical data can be included in order to identify all essential components and elucidate the still existing anatomical uncertainties. To create a patient-specific three-dimensional pelvic model proper software is developed to map this pelvic model...
on conventional CT and MR images. CONCLUSIONS. Virtual Reality technology can provide an ideal training and simulation environment to practice a variety of surgical situations on a virtual copy of the patient.

DIEGEL, Julien1 and Brion BENNINGER.1-8 Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon, OR. Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon & Corvallis, OR. Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA.

Pericardiocentesis: Combining novel subxiphoid-right sternoclavicular joint approach with a thorax dissection lab for a clinical experience.

INTRODUCTION. In 1979 echocardiograph revolutionized elective pericardiocentesis (PC). Ultrasound is not always accessible in the ‘field’ resulting in emergency life-saving blind techniques with serious side-effects(SE). Two classic approaches, subxiphoid to left axilla/shoulder and direct left transthoracic exist. Recently, a novel blind subxiphoid-right sternoclavicular joint approach (SRSJa) was developed. SRSJa appeared anatomically safe and technically simple. However, there have been no follow-up studies. The objective of this study was to investigate the accuracy of the novel SRSJa using medical students to perform PC during a thorax dissection lab. METHODS. Literature search was conducted regarding PC approaches taught during routine dissection. Students (14) with no PC experience were informed how to perform SRSJa on 14 embalmed cadavers injecting approximately 80mls of fluid into the pericardial space(PS) followed by dissection to assess fluid placement. RESULTS. Literature search revealed no anatomical description of PC in anatomy textbooks. The two classic techniques were explained in specialty texts, atlases and websites. SRSJa was described in 2011 with no studies conducted since. Dissection revealed 13/14 students using SRSJa were successful placing PC needle into the PS with no obvious injury to other structures. DISCUSSION. Blind emergency PC remains an important skill associated with serious SE. There is need to develop an improved blind approach. Students with no previous PC experience performed SRSJa successfully on cadavers. This pilot study suggests more studies be conducted using the SRSJas. CONCLUSION. This study revealed that SRSJa could be conducted successfully with minimal training and injury to relevant structures during thorax dissection.

DOBINS, Joanne J. and David J. PORTA. Department of Biology, Bellarmine University, Louisville, KY 40205, USA.

Mold on cadavers: indigenous or imported?

INTRODUCTION. Formalin fixation should prevent the decay of cadavers while also retarding mold growth. Due to the potential pathogenicity of many species of fungal contaminants, whenever mold is evident in a laboratory, identification is warranted. Cadavers were procured from an out of state medical school for a gross anatomy class and a serious mold problem developed almost immediately. The aim of this study was to determine if the contaminant originated locally or from the embalming site. METHODS. We collected air-borne samples using a bioaerosol impact sampler device. Samples were collected over an agar plate at an air flow rate of 28 l/min for 3 minutes at a height of 3.5 ft. Additional samples were obtained by direct specimen plating from preserved tissue. Several locations were chosen for analysis throughout the lab as well as near air distribution vents. Air samples were obtained from outdoor surrounding locations to use as control comparisons with the room air. Using traditional methodologies for fungal collection and identification, fungal colony forming units (CFU) were analyzed with an attention to the ratio of filtered air counts versus the control sample air counts. RESULTS. Virtually no mold was recovered from laboratory air-borne samples but several species of Penicillium, Aspergillus, Cladosporium, Fusarium, Fonsecaea, Gilocladium and Rhizopus were recovered.
from direct specimen cultures of the cadavers. CONCLUSIONS. Final analysis revealed that the dissection lab was not the probable source of the mold. Fortunately, in the following year, specimens were obtained from a different source and there was no repeat of the mold colonization. We suspect there may have been problems during preparation of the embalming fluid at the site of the first supplier.

FLEMING, Scott, Alan E. SEYFER, and David R. WELLING. Department of Anatomy, Physiology and Genetics and the Department of Surgery, Uniformed Services University of the Health Sciences, Bethesda, MD 20814, USA.

Finding anatomy through the internet – Ranking websites that list online anatomy resources.

INTRODUCTION. As technology advances, the student of anatomy desires new resources to supplement traditional modalities. Valuable online content currently exists but some sites are less desirable, and without guidance one can waste countless hours sifting through online resources. This investigation located and ranked websites that list anatomy resources in order to prioritize the sites according to usability and educational value. As a result, users can now maximize their own educational enrichment. This provides a valuable ranking of computer-based resources to augment study for medical students as well as faculty. METHODS. The internet search employed the two most popular search engines: Google and Bing. Sites were examined using a variety of search terms including; “anatomy resources internet study”, “human anatomy sites links”, and “medical anatomy sites links”. Once located, the sites were awarded a score based on criteria that emphasized relative value to anatomy students and faculty. Some of the ranking criteria included: the number of links posted; whether listed links are categorized; if the links work easily and accurately; and whether the site ranks any recommended links. RESULTS. The sites with the highest point total are recommended as the best web sites for finding internet anatomy resources. While multiple sites scored high, the ThinkAnatomy.com site exceeded all others. CONCLUSIONS. This ranking method offers a more efficient use of available resources to augment the study of medical and clinical anatomy. For students and faculty, it can conserve valuable time by providing the best locations to start their search for anatomy on the internet.

FOGG, Quentin A. Laboratory of Human Anatomy, School of Life Sciences, University of Glasgow, Glasgow, G128QQ, UK.

3D printing of carpal fusions: a new approach to experimental anatomy.

INTRODUCTION. Late stage degenerative joint disease of the intercarpal joints presents the surgeon with numerous procedural choices, but also a number of dilemmas. Improved understanding of carpal anatomy appreciates functional sub-typing, but this does not as yet relay easily into improved surgical management. This study aims to demonstrate a new method of surgical simulation using four-corner carpal fusions on 3D printed models. METHODS. Cadaveric specimens were screened radiologically to identify extreme lunate types. A single type 1 and type 2 specimen were selected for the study. Both were CT scanned, subject to a four-corner fusion and scanned again. Each scan was modelled in 3D and thresholds adjusted to enhance bone definition. Multiple 3D models were then created out of a biomechanically suitable bone composite using a 3D laser printer. A third model for each type was printed and modified to simulate post-operative bone growth (using living patient scans as references). Each model was subject to biomechanical testing. RESULTS. Wrist with a type 2 lunate were stronger and more stable in all cases, but most significantly in the postoperative model without simulated bone growth. Simulated bone growth increased stability in both types, but type 2 was still stronger and more stable. CONCLUSIONS. This technique provides a novel, inexpensive and efficient means of testing real anatomy. The great advantage was being able to do multiple destructive tests on anatomically identical models, thus allowing isolated testing of individual variables. These data demonstrate that carpal typing is an important factor in surgical
management of those with extreme carpal types. Further work will improve our understanding of these differences.

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Can anatomic traits help misidentifying the mendosal suture with a fracture? A radiologic study.

INTRODUCTION. Radiologic diagnose of skull fractures in children is difficult due to numerous accessory sutures. Around the occipital bone normal anatomic variants, such as the mendosal suture might mislead the clinician as a skull fracture. We have investigated the anatomic traits of this suture among children. METHODS. 52 cases, aged between 1 month and 4 years, which have undergone 3D-CT have been evaluated retrospectively. The frequency, length, and the angle between lambdoidal and mendosal suture lines were evaluated. RESULTS. The presence of the mendosal suture was bilateral in 12 cases and unilateral in 5 cases. The length of these sutures ranged from 10 to 20.4 mm on the right side and 6 to 18 mm on the left side, respectively. The angle between two suture lines ranged from 35 to 75° on the right side and 39 to 83° on the left side. CONCLUSIONS. The anatomical data acquired with this study regarding the mendosal suture might allow the radiologists and clinicians to differentiate it from fractures.

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A three-dimensional investigation of the pathologic supraspinatus.

INTRODUCTION. Rotator cuff tendon tears involving the supraspinatus (SP) are common. To date, the musculotendinous architecture of SP with varying degrees of tendon tears has not been well documented. The purpose of the study was to investigate the detailed 3D architecture of the pathologic SP throughout its volume. METHODS. Five formalin embalmed specimens (mean age 72 years) were used. Three-dimensional coordinates were collected in situ using serial dissection and digitization. Data was modeled using Autodesk® Maya® 2011. Fiber bundle lengths (FBL), pennation angles (PA), and tendon dimensions for each architecturally distinct region were computed and then analyzed. RESULTS. One specimen had a partial-thickness bursal sided tear of SP, another a focal full-thickness SP tear, and the remaining three specimens had a massive tear with tendon retraction. Anterior and posterior regions were present in four of the five specimens. In the specimen with the most retracted tendon tear, the posterior region was not present. Mean FBLs were shorter in the specimens with retracted tendons with greater changes to the posterior region. Mean PA was larger in the specimen without a posterior region compared to all other specimens. CONCLUSIONS. Architectural changes of SP are associated with the degree of the tendon tear and the regions are impacted differently. The anterior and posterior regions appear to reorganize into a single region when the tear is large with extensive tendon retraction. These results provide insight into the pathologic function of the muscle and may aid in improving surgical repair techniques of the torn rotator cuff.

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Ultrasound investigation of the musculotendinous architecture of supraspinatus following concentric and eccentric exercise training: a pilot study.

INTRODUCTION. Resistance training for the supraspinatus (SP) is widely used to improve glenohumeral joint stability and prevent rotator cuff tendon pathology. To date, however, few
studies have investigated the architectural changes following resistance training of SP. Thus, the purpose of this study was to investigate architectural changes in the distinct regions of SP following training. METHODS. Six healthy participants (4 female/2 male), mean age of 29 years, were recruited and randomly assigned into an 8 week unilateral concentric or eccentric resistance training program for SP; shoulder abduction in the scapular plane. Before and after training, architectural parameters, fiber bundle length (FBL), pennation angle (PA) and muscle thickness (MT), were measured using an ultrasound protocol developed by Kim et al. (2010) and shoulder abduction strength (isometric, concentric, and eccentric) recorded using an isokinetic dynamometer. RESULTS. Mean percentage change in FBL in the anterior region was similar between the concentric and eccentric training groups. Mean percentage change in PA, however, differed between the two groups. In the concentric group, mean PA increased and demonstrated a mean percentage change of 20.3% while in the eccentric group mean PA decreased slightly and demonstrated a mean percentage change of 2.0%. Muscle thickness increased in both groups and mean percentages of change were 4.1% and 6.0% for concentric and eccentric groups respectively. CONCLUSIONS. Training-induced changes in SP architecture can be investigated using ultrasound. Concentric training has a larger impact on PA in the anterior region than eccentric. Further study may add substantially to the understanding of strength gains and the underlying pathomechanics of this muscle.

KOLLIAS, Theofanis, Robert G. LOUIS Jr, R. Shane TUBBS, Jeffrey ELIAS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. Intercostal to long thoracic nerve transfer for the treatment of winged scapula - Cadaveric feasibility study.

INTRODUCTION. Despite being a relatively common problem, very few surgical options exist for the treatment of winged scapula. We propose the possibility of harvesting intercostal nerves for nerve transfer to the long thoracic nerve (LTN) as a possible solution to this dilemma. METHODS. In an attempt to assess the technical feasibility of intercostal to LTN nerve transfer, ten formalin fixed adult human cadavers (20 sides) were examined. RESULTS. The LTN was identified along the lateral border of serratus anterior and intercostal nerves were identified along the inferior surface of each rib at the mid-axillary line. At the level of the mid-clavicular line, each intercostal nerve was sectioned and mobilized. Measurements were made of the length and diameter of each intercostal nerve available for mobilization to the LTN. Tensionless anastomosis to the LTN was achieved for the 3rd, 4th, 5th and 6th intercostals provided each intercostal was preserved and mobilized anteriorly at least as far as the midclavicular line. CONCLUSIONS. Harvest of multiple intercostal nerves is possible and may provide surgeons the additional ability to neurotize the LTN for restoration of shoulder function.

LAMBERT, H. Wayne1, Jacob N. FOX, Stavros ATSAS, Sean C. DODSON, Blake T. DANEY1, Mackenzie J. CLARKSON, Jonathan J. WISCO2. 1West Virginia University, Morgantown, WV 26506, USA. 2University of California-Los Angeles, Los Angeles, CA 90095, USA. How to expand translational research through use of cadaveric material: Current studies and results.

INTRODUCTION. The goal of translational research is to allow biomedical research discoveries to go from the “bench to the bedside” to impact health outcomes and improve patient care. By pairing with clinical research faculty, an anatomist can actively engage in translational research through the use of cadaveric material. This presentation will guide faculty through how to create clinical research collaborations and show current translational research projects, which include studies to improve orthopedic surgical outcomes, to document extra-cardiac neural remodeling following cardiac pathology, and to study age-related changes in blood vessels which may
lead to arteriogenic erectile dysfunction. METHODS. Research projects were developed through collaboration of clinical research faculty. Human cadaveric material was dissected, measured, and analyzed with histologic and immunohistochemical studies as well as statistical analyses. RESULTS. Dissection of 107 legs led to the development of 90% and 95% confidence intervals to assist surgeons in localizing the sural nerve at the lateral border of the calcaneal (Achilles) tendon during calcaneal tendon repair. Dissection of human hearts and stellate (cervicothoracic) ganglia led to the first documented evidence of neural remodeling following myocardial infarction in humans. The first histologic study of the internal pudendal artery was performed to assess age-related changes that may lead to erectile dysfunction. CONCLUSIONS. Collaborations between anatomists and clinical researcher faculty can benefit patient care and surgical outcomes. With National Institute of Health (NIH) increasing translational research funding, this presentation will inform anatomists the necessary steps to get a piece of the “clinical research pie”.

LARKIN, Theresa, Darryl McANDREW, Noel TAIT, and Saheeda ZOTTER. Graduate School of Medicine, University of Wollongong, NSW, Australia. Ultrasound as a teaching tool in anatomy classes in an integrated medical curriculum.

INTRODUCTION. Ultrasound is becoming increasingly accessible and cost effective as a “point-of-care” diagnostic tool in medical practice worldwide, particularly with the advent of handheld scanners and their potential for routine use in clinical examination. Consequently, a minimum skill level in ultrasonography will soon be essential to produce competitive and competent medical graduates, and incorporation of ultrasound training in medical curricula is timely. METHODS. Our graduate-entry MBBS degree utilises an integrated, spiral curriculum. We have designed an ultrasound curriculum to be delivered over the duration of this course, complementing: anatomy and physiology in Phase 1; clinical examination in Phase 2; rural clinical placement in Phase 3; and hospital emergency assessment in Phase 4. RESULTS. To complement anatomy teaching in Phase 1, we established an ultrasound curriculum comprising a series of online modules covering ultrasound principles, a demonstration on body cavities and fluid, and practical scanning activities guided by a Sonographer in the relevant body system blocks. In these classes, we include a clinical scenario and combine ultrasound and anatomy of: the abdominal aorta, popliteal vessels, pancreas, spleen, liver, gallbladder, kidneys and bladder. CONCLUSIONS. Introducing our medical students to ultrasound principles and techniques during Phase 1 allows the students to apply the anatomy content in a clinical context, and gives the teaching significance and relevance, all important pedagogical principles that enhance anatomy learning and teaching. Further, acquiring some initial experience and confidence in ultrasound provides a base upon which further practice and skills can be obtained during their later longitudinal clinical placements.

LI, Zhi1, Kajeandra RAVICHANDIRAN1, Dongwoon LEE2, Nancy MCKEE1, and Anne AGUR1. Departments of Surgery1 and Computer Science2, University of Toronto, Toronto, ON, M5S 1A8, CA. An architecturally comprehensive 3D computer model of the intrinsic musculotendinous structures of the hand.

INTRODUCTION. The spatial arrangement of fibre bundles (FBs) within a muscle contributes to determining its functional capability. However, existing biomechanical models of the hand have not incorporated detailed musculotendinous architecture obtained throughout the volume of the muscle, as in situ. The objective of this study is to construct a comprehensive 3D computer model of the musculotendinous structures of intrinsic muscles of the hand, from a single cadaveric specimen. The comprehensive 3D volumetric model includes muscle fibre bundle architecture, as well as the details of the extra and intramuscular tendons. METHODS. The musculotendinous
elements of the intrinsic hand muscles of one formalin-embalmed cadaveric male specimen were digitized (MicroScribe™ G2 digitizer) and the bony skeleton scanned (FARO Laser ScanArm®). The data were reconstructed in Maya® to create a volumetric 3D model and architectural database of intrinsic hand muscles. RESULTS. The number of FBs digitized depended on the size and complexity of the muscle, e.g., 400 FBs for abductor pollicis brevis. From the digitized data, architectural parameters of each muscle (i.e. FB length, pennation angle, physiological cross-sectional area, and muscle volume) were computed. The model and parametric data allowed for the visualization and comparison of muscle architecture, locations and dimensions of the extra and intramuscular tendon, and regional variation within the muscle. CONCLUSIONS. A highly detailed and anatomically accurate volumetric model of the intrinsic hand muscles has been created from in situ digitized data of a single specimen. The extensive architectural data will be used for future model building to enhance the understanding of the mechanics of hand function.

LOUKAS, Marios, Robert HAGE, Danny BURNS, Robert JORDAN, Vishnu RAO, Brian CURRY, Feisal BRAHIM, Ewarld MARSHALL, Kathleen BUBB, Alena WADE, Rachel GEORGE, and Shubhra BARHUAH. St. George's University, St. George’s, Grenada, West Indies.

INTRODUCTION. Since the Flexner reports of 1910, great debate has surrounded medical school curricula. Recently, both problem-based and traditional teaching modalities within medical school gross anatomy curricula have been the subject of considerable controversy. METHODS. This paper examines the modified, multimodal, anatomy curriculum at St. George’s University School of Medicine. The reformed program emphasizes the importance of a balance of both traditional and problems based curriculum to ensure a horizontal and vertical integration of core concepts of the basic sciences and clinical competencies. RESULTS. More specifically, the paper describes the teaching modalities employed to teach 650 students per semester (twice a year) including lectures, PBL sessions, gross lab sessions (with the use of cadavers, plastinated cadavers ultrasound and endoscopes), imaging sessions with ultrasound hand on experience sessions, physical examination sessions and research sessions. The USMLE type of anatomy exams and faculty team-based approach to teaching will also be presented. CONCLUSIONS. The innovative curriculum reform, fueled by technological advancements, improves upon previous course standards thereby equipping students with the tools to become lifelong learning physicians.

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INTRODUCTION. Teaching anatomy to healthcare students has undergone the greatest fluctuation of the basic sciences during the past 100 years. Surface and radiological anatomy is a common language for all clinicians regardless of specialty. Vertical curriculum allows and requires basic science courses to integrate and utilize the benefits of interprofessional (IPE), interdepartmental (IDE) and self-learning (SLE) education. Anatomy dissection labs are the initial vehicle to employ such a foray of learning using full-body dissection, donor-cadaver-patient-radiology (DCPR), IPE, IDE, SLE tutorials and hospital technology during an accelerated anatomy course. The objective of this study was to investigate, develop and employ a teaching millennial anatomy dissection lab. METHODS. Literature search was conducted regarding current
strategies and technologies used in teaching anatomy dissection while combining IPE, IDE, SLE and DCPR. 18 embalmed cadavers were imaged with roentgenographs, CT/MRI scans and ultrasonography. IPE, IDE was integrated into the lab. RESULTS. Literature search revealed no studies integrating IPE/IDE, DCPR and full-body dissection during the dissection lab. IPE, IDE, DCPR and dissection tutorials were successfully employed and well received objectively and subjectively. DISCUSSION. Despite the surging molecular based sciences consuming much of the curriculum, full-body dissection is irreplaceable. Anatomy labs can nurture creative educational arenas. The millennial anatomy lab could showcase IPE, IDE and teach professionalism during the anatomy lab. CONCLUSION. This pilot study revealed an anatomy lab can integrate weekly tutorials from IPE, IDE, SLE, DCPR and student dissections with hospital technology to provide a realistic clinical experience.

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Defining the surface anatomy of the parotid duct in vivo.

INTRODUCTION. The surface anatomy of the parotid duct is described inconsistently in anatomy reference texts and yet its course is important when assessing facial lacerations. The aim of this study was to map the parotid duct in healthy adults using ultrasound. METHODS. 50 healthy adults (31 females, mean age 33 years) were scanned by an experienced sonographer using a 13-5MHz linear probe and a Siemens Sonoline Antares ultrasound machine. The caliber, length and course of the parotid duct were recorded bilaterally. RESULTS. The parotid duct was easily identified bilaterally in all participants. One subject had a double duct bilaterally. In the remaining 49 cases (98 ducts) the duct had a mean maximum caliber of 0.6 ± 0.2mm and length of 42 ± 7.5mm. In these cases the parotid duct ran a straight course crossing a line between the intertragic notch and the angle of the mouth from below in 53% of cases. The duct was entirely below this line in a further 39% and above in 8%. CONCLUSIONS. This is the first study to document the course of the parotid duct in normal adults using ultrasound and it demonstrates that current surface anatomical landmarks are inaccurate. The parotid duct is more accurately defined in relation to a line between the intertragic notch and angle of the mouth. A better understanding of the surface anatomy of the parotid duct should assist with the early diagnosis of parotid duct injuries and the avoidance of complications such as sialocele, salivary fistula, and infection.

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Bringing light to the labyrinth; a new view of the inner ear.

INTRODUCTION. Work is in progress on a new video presentation of human inner ear anatomy. An essential component of this presentation is an accurate 3D representation of the human bony labyrinth that can be integrated with video footage of real anatomy. This task was undertaken as part of a medical student elective in clinical education. METHODS. An existing Wood's metal cast of a human bony labyrinth was scanned to create a rough 3D model, with serial photographs used for refinement. This was then used as the basis of a comprehensive 3D replication, with internal architecture, efficient topological flow and high spatial-frequency normal mapping for photorealistic detail. RESULTS. A fully accurate model was created, which corresponds to the original when viewed from any angle. The model can be transected or disassembled to provide an interior view. The model has appropriate coordinate registration for motion tracking, allowing it to be integrated with other footage in commonly used video compositing programs. CONCLUSIONS. It is envisioned that this model will be a key component of a useful learning aid for medical students and health professionals who need to develop a
greater understanding of this area of anatomy. Sections from the video will be demonstrated as part of this presentation, with discussion of some technical aspects of development.

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The anatomical relationships of the gastroc-soleus and fibularis longus muscles, determining the practicality of a novel tendon transfer.

INTRODUCTION. Peroneal muscle weakness is a common pathology in foot and ankle surgery. Polio, Charcot-Marie-Tooth disorder and spina bifida are associated with varying degrees of fibularis muscle paralysis. Tibialis Posterior, an antagonist of the fibularis muscles, becomes pathologically dominant, causes foot adduction and contributes to cavus foot posture. Current tendon transfers are devised to overcome this disability. However the action of a tibialis anterior split transfer and a tibialis posterior transfer produces a balanced foot in dorsiflexion, but does not provide an everting moment during plantar flexion in toe weight bearing. The foot remains unstable in toe off. Refunctioning fibularis longus would enhance stability in toe off and resist the deforming force of tibialis posterior. This study determines the feasibility of a novel tendon transfer between fibularis longus and gastroc-soleus, thus enabling gastroc-soleus to power a paralysed peroneus tendon.

METHODS. 12 human disarticulated lower limbs were dissected to determine the safety and practicality of a tendon transfer at the junction of the middle and distal thirds of the fibula. The relationship of the sural nerve to the palpable posterior border of the fibula and the angular relationship of fibularis longus to gastroc-soleus were measured.

RESULTS. The mean angle between the tendons of gastrocnemius and fibularis longus was 3 degrees. The Sural nerve lies on average 30mm posterior to the palpable posterior border of the fibula. There were no intervening structures to prevent the proposed tendon transfer.

CONCLUSIONS. The line of action of fibularis longus and gastrocnemius are functionally collinear. Gastrocnemius can substitute a paralysed fibularis longus. The surgical approach is safe and practical.

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Anatomical injury analysis of restrained cadavers in frontal collision testing.

INTRODUCTION. The kinematics of 5 restrained, male volunteers, braced and not braced, were compared to each other, to crash test dummies, and to fresh cadavers of similar size in simulated low speed frontal collisions. No injuries were produced in the volunteers or the cadavers so the cadavers were subjected to a higher severity test- results reported here.

METHODS. Using a 1.4MN ServoSledTM system, three 50%ile male cadavers (ages 51, 63, & 79) were subjected to frontal collisions similar to government tests which resulted in a change in velocity of 25 mph. Specimens were secured with standard driver’s 3-point safety belt (without pretensioner and airbag) to a rigid seat. Numerous accelerometers and load cells were mounted to the sled system and seatbelt. The cadavers were instrumented with 23 strain gauges affixed to the sternum, left clavicle, and several ribs. The respiratory system was pressurized via tracheostomy and the vascular system was perfused via the left carotid artery. Post-test analysis consisted of X-rays and dissection.

RESULTS. Videos showed all 3 specimens flexed over the shoulder belt with the heads of the 2 younger specimens striking the rigid steering column. The
first, and youngest, had 5 rib fractures (3 right, 2 left). The second specimen exhibited a horizontal fracture of the C-7 vertebral body and bilateral mandibular fractures along with 15 rib fractures (12 R, 3 L). The last, and oldest specimen, had a nearly identical C-7 fracture in combination with 26 rib fractures (17 R, 9 L). CONCLUSIONS. Seatbelts, while the most critical safety feature of a car, can cause injuries. However, anomalies like a prior craniotomy, bifid xiphoid process, floating 10th ribs, and a pacemaker, appeared to have no significant affect on injury pattern.

POST, Kevin1 and Brion BENNINGER1-8. Departments of Anatomy1, Family Medicine2, COMP-Northwest, Western University of Health Sciences, Lebanon, OR; Orthopaedics3, General Surgery4 Samaritan Health Services, Lebanon & Corvallis, OR, Departments of Orthopaedic Surgery and Rehabilitation5, Surgery6, Integrative Biosciences7, Oral Maxillofacial Surgery8, Oregon Health and Science University, Portland, OR 97239, USA.

Tibial tuberosity: a morphological mystery with clinical significance.

INTRODUCTION. The Tibial Tuberosity (TT) is thought to have formed from the attachment of the patellar tendon. The posterior margin of the TT is the proximal growth plate of the tibia. The TT is a major surface landmark for clinical procedures and orientation. Contemporary anatomy texts provide minimal morphology and atlases usually illustrate a single apex TT. Some atlases illustrate a double apex but only label one of the two eminences. The objective of this study was to investigate the morphology of the TT and relate this clinically. METHODS. A literature search was conducted on anatomy texts, atlases, journals, websites and specialty texts and journals regarding the morphology of the TT. Observation, morphological measurements and analysis were conducted on 68 tibial bones (34R, 34L). Measurements were recorded from 1.) Anterior tibial plateau to the apex of the TT, 2.) Superior to inferior height and 3.) Horizontal width of the TT. If double apex was present the proximal one was chosen. RESULTS. Literature search revealed inconsistent TT morphology. Mainly, inadequate descriptions or illustrations depicting single or double apex TT. Observations revealed 49/68 (72%) TT were double apex and 19/68 (28%) TT were single apex. DISCUSSION. The TT is an important landmark for surface anatomy, orientation to knee structures, landmark of the epiphyseal plate and surgical procedures. This study revealed a double apex in 72% of the TT analyzed. The double apex may complicate some who palpate and measure from its superior eminence and others from the inferior eminence, which could lead to erroneous measurements in the clinical arena. CONCLUSIONS. This study revealed overwhelming evidence that anatomical and clinical texts reevaluate the accuracy of TT morphology.

PRIOR, Alesha, Timothy ROACH, Benjamin TURNER, Kathleen BUBB, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies.
An endoscopic and ultrasound approach to the valves of the small saphenous veins.

INTRODUCTION. The small saphenous valve is the ostial valve of the small saphenous vein. Knowledge of its anatomy is important for several invasive and non-invasive procedures regarding several conditions including varicose veins. The aim of this study was to describe the anatomy of the valves of the small saphenous veins with the use of ultrasound and surgical endoscope. METHODS. We examined 50 adult healthy individuals with the aid of Logiq E ultrasound unit using a 12Hz transducer. In addition we examined 50 cadavers with the aid of 5mm 0 degrees flexible and rigid Stryker endoscopes. RESULTS. The number of valves of the small saphenous vein corresponded to the number of tributaries with a range of 4 to 13. The mean number of valves was 8. The valves exhibited a bicuspid morphology and were located inferior to the junction of the tributaries. The mean diameter of the valves was found to be 3.1mm. CONCLUSIONS. Endoscopy and ultrasound examination of the valves of the small saphenous veins are good and reliable methods of visualizing normal and pathological valves.
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Architecture and functional characteristics of the supra- and infrahyoid muscles: a three-dimensional modeling study.

INTRODUCTION. The suprahypoid and infrahyoid muscles play a vital role in the swallowing process (deglutition) in humans. Previous studies describing the architecture of the muscles that contribute to deglutition have relied on direct cadaveric measurements, electromyography, radiographic methods or finite element models (Borst et al., 2011). Without 3D visualization and analysis, these methods are unable to capture the complex architecture and inter-relationships of these muscles. The purpose of this study is to create a 3D model of the suprahypoid and infrahyoid muscles from digitized cadaveric data, to document their architectural parameters and functional characteristics. METHODS. In one male cadaveric specimen, four suprahypoid (genio-, mylo- and stylohyoid; digastric) and five infrahyoid (omohyoid; sternohyoid; sternothyroid; cricothyroid) muscles were serially dissected and digitized using a Microscribe™ 3DX digitizer. Their bony attachments, the hyoid bone, and trachea were also digitized. The coordinate data was imported into Autodesk™ Maya™ 2011 and reconstructed into a 3D model, and used to compare the architectural parameters of these muscles. RESULTS. The fully manipulable 3D model of the muscles and their attachment sites was used to visualize the complex inter-relations of the suprahypoid and infrahyoid muscles. The fiber bundle length, pennation angle and PCSA were calculated using the method described by Ravichandiran et al. (2009). These parameters were then used to compare muscle architecture and functional characteristics of these muscles. CONCLUSIONS. Three-dimensional visualization and analysis of the architecture of the suprahypoid and infrahyoid muscles can further our understanding of the process of deglutition in normal and pathologic states.

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INTRODUCTION. The distribution of the cranial nerves and the parasympathetic pathways associated with them is sometimes difficult to conceptualize, as some nerves pass through small spaces within the skull. 3D technology offers a unique way to understand these difficult regions. METHODS. To create an accessible study tool in which medical professional students can travel through a “Cranial Nerve Skywalk”, a 3D display of the cranial nerves in a free, web-based virtual world known as Second Life™, and specifically to assess its usability and value among populations of dental students. RESULTS. Relevant bones of the craniofacial skeleton were scanned and uploaded into the virtual world and were reassembled to form the portion of the skull that transmits branches of the cranial nerves, III, V, VII, and IX. Using modeling tools built into the Second Life™ program, basic shapes were used to represent nerves and were superimposed on the bony structures/foramina in the skull. Specific colors were used to denote whether a nerve was sensory, somatomotor, or visceromotor (parasympathetic divisions only). Slideshows were inserted at each cranial nerve station in the cranial nerve skywalk to provide supplemental information and to provide a 2D image that paralleled the 3D representation. This tutorial was introduced to dental students new to learning the cranial nerves and a population of dental students that used it as a refresher on previous material. CONCLUSIONS. Medical professional students considered a one-stop 3D tutorial of the cranial nerves beneficial to their mastery of the
spatial distribution and modalities of the cranial nerves, as well as a sufficient way to review previously learned material.

ROACH, Timothy, Alesha PRIOR, Ewarld MARHSALL, Alena WADE, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies.
An endoscopic approach to the valve of the inferior vena cava.

INTRODUCTION. Although the clinical anatomy of the heart has been very well illustrated, certain structures that possess significant clinical importance remains to this day incompletely described. One of these structures is the valve of the inferior vena cava, the Eustachian valve (EV). The pathologies that have been documented in association with a variation of the EV include: patent foramen ovali, vegetative masses, myxoma, papillary fibroelastoma, endocarditis and paradoxical emboli. The aim of this study was to describe the anatomy of the Eustachian valve with surgical endoscope. METHODS. We examined 100 adult cadaveric hearts with the aid of a 5mm 0 degrees flexible and rigid Stryker endoscope. RESULTS. In 22% of the cases the EV was present as a ridge like structure at the inferior most part of the right atrium. In the majority of the cases the EV exhibited a membranous flat structure covering 37% of the ostium of the IVC. In 3 cases the EV was associated with a Chiari’s network. CONCLUSIONS. Remnant EVs are common, occurring in 70% of all children and 57% of patients with patent fossa ovale. Accurate knowledge of these variations may prove useful to diagnose and prevent iatrogenic complications.

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Arterial supply of Segment IV of the liver and its relevance to living donor liver transplantation and split liver transplantation.

INTRODUCTION. Preoperative evaluation of arteries supplying segment IV is critical and may impact the surgical planning during split liver transplantations and living donor liver transplantations. METHODS. Postmortem dissections of 30 livers were performed to evaluate the arterial supply of segment IV of left liver. RESULTS. The variant patterns of artery to segment IV were classified into five types in relation to its source of origin, its extra and intrahepatic course and arterial configuration of liver – normal or aberrant. Artery to segment IV was an extrahepatic branch (middle hepatic artery, MHA) in 80% and an intrahepatic branch (segment IV artery, A4) in 20% of livers. In the livers with normal hepatic arterial configuration, middle hepatic artery arose either from left hepatic artery (27%) or right hepatic artery (17%) whereas in livers where arterial anatomy was aberrant, middle hepatic artery arose from common/ proper hepatic artery (23%). There was no case in which middle hepatic artery was arising from replaced / accessory vessel. In the livers with intrahepatic segment IV artery, segment IV artery was seen to be arising from one of the segmental branches of left hepatic artery and all the livers had normal hepatic arterial anatomy. CONCLUSIONS. The patterns observed in the present study reflect the embryological pattern of arteries and the classification formed may favorably influence the outcome of living donor liver transplantations.

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Quantitative study of articular pillars in typical cervical vertebrae as guidelines to the lateral mass screws

INTRODUCTION. The study is aimed to form a statistical data on the dimensions of the articular pillars in typical cervical vertebrae, an important tool for a surgeon for planning lateral mass
METHODS. The study was conducted on a random sample of eighty-one dried, typical cervical vertebrae (C3-C6). The transverse, vertical, anteroposterior, and oblique dimensions of the articular pillars were taken by VWR stainless steel vernier calipers with .01mm accuracy. The data was statistically evaluated. RESULTS. The average smallest transverse diameter of the articular pillar varied from 5.99 mm to 15.36 mm (mean = 10.47 ± 1.45). The average anteroposterior diameter of the articular pillars is an estimate of the screw length used by Roy-Camille technique and varied from 3.88 mm to 12.69 mm (mean = 8.59 mm ± 1.55). Statistically significant relationship was found between the transverse and the anteroposterior measurements (p value < 0.0001). The oblique anteroposterior diameter is an estimate of the screw length used by Magerl method and varied from 10.80 mm to 20.34 mm (mean = 14.86 mm ± 1.78). The average height of the articular pillar varied from 14.22 mm to 25.50 mm (mean of 20.07 mm ± 2.13). A statistically significant relationship was found comparing the vertical height of the articular pillar to the oblique anteroposterior diameter (p < 0.0001). The oblique anteroposterior diameter (y) = 0.6633 x Height of the articular pillar (x) + 0.1546 (R2 = 0.6929).

CONCLUSIONS. This study serves as an important guide for the selection of the lateral mass screws in an individual patient and it is possible to estimate preoperatively the length of the lateral mass screw by measuring the vertical height of the articular pillar in the radiograph of a patient.

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INTRODUCTION. To explain the very complicated composition of the external genitalia, it is necessary to comprehend the developmental and comparative anatomical basis of this region. The comparative anatomical stages of the penis are shown: Stage 1 (reptiles, monotremes), the intracloacal penis, Stage 2 (marsupials) separation of the penis and anus by a septum within the cloaca, Stage 3 (mammals) rotation of the separated penis, and Stage 4 (primates & man) exposure of the penis from the lower abdominal wall. METHODS. The pudendal nerve of 5 human cadavers was dissected. RESULTS. A novel scheme of the nerve arrangement of the external genitalia, drawn in consideration of its relationships to the nerves of the lower limb is proposed. From the viewpoint of innervation, the external genitalia are divided into anterior portion (lumbar plexus supply) and posterior portion (sacral plexus supply). The penis of the primitive stage is located within the posterior portion and then it protrudes into the anterior portion in the definitive stage. Even among the three branches of the pudendal nerve, the levels of segmentation and stratification are observed at the origin of these branches from the sacral plexus. CONCLUSIONS. The stratification arrangement corresponds to the distribution arrangement of the pudendal nerve branches. These results are explainable by the comparative anatomy findings. A DVD of actual dissection showing the unique course of the human pudendal nerve which corresponds to the above-mentioned stages and its distribution to the perineal muscles is included.

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Anatomical Materials: Training Researchers, Students and Clinicians in the Safe and Respectful Use of Donor Specimens.

INTRODUCTION. Academic donation programs, in general, have taken great strides to establish written policies and procedures and adhere to best practices as stewards of body donors and anatomical specimens, ensuring that donors are treated with the utmost level of respect. Still,
we face the challenge of how to best educate specimen requestors, emphasizing that anatomical materials are a precious resource and that campus policies are designed to protect both donors and the integrity of the institution while facilitating the advancement of education and research. The authors will share a training module that supports this mission. METHODS. Create a training program, such as a slideshow, integrating written policies and procedures. Involve staff and requestors in the creation of the training, and invite them to provide feedback. Use examples. Provide useful resources, such as contact information. Require that participants take a quiz to gauge their understanding of policy. Offer the training with a speaker or as a self-study, and make training mandatory. RESULTS. In one example, a department was found to be non-compliant on its inventory accuracy and general care of specimens during an annual inspection. As a result, the department was no longer able to receive specimens until every specimen user in the dept. was trained on the requirements for using anatomical materials. Training was provided in two forms: attendance at a grand rounds session or other in-person meeting; and, training via an online course. CONCLUSIONS. Integrating a mandatory training protocol for users of anatomical materials can result in deeper respect for anatomical specimens, better compliance with policies and procedures, and may reduce the amount of time required to manage these issues.

SNOSEK, Michael, Sharath BELLARY, Neslihan CANKARA, Mohammadali M. SHOJA, R. Shane TUBBS, Robert J. SPINNER, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies.

Ulnar nerve innervation of the medial head of the triceps brachii muscle: a cadaveric study.

INTRODUCTION. Although the ulnar nerve is closely associated with the triceps brachii muscle, the literature does not normally describe it as supplying this muscle. However, recent research has examined the ulnar nerve in the upper arm and identified branches supplying the medial head of the triceps brachii. This study aims to expand upon this research by describing the course and incidence of these branches in a larger sample size. METHODS. We examined 50 specimens in 25 cadavers. RESULTS. Ulnar innervation of the medial head of the triceps brachii was identified in 14 specimens (28%). The mean distance of the ulnar nerve branch midpoint between the surgical neck and an epicondyle line was 26%, with a range of 11% to 39%. CONCLUSIONS. Innervation of the triceps brachii muscle by the ulnar nerve has important clinical and surgical implications.

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A 3D model of vastus medialis oblique fibre bundle architecture.

INTRODUCTION. Although there is controversy about the compartmentalization of vastus medialis (VM) into long (VML) and oblique (VMO) parts, the fibres of VMO are considered to be important for stabilization of the patella. However, the fibre bundles (FBs) of VMO have not been volumetrically characterized. PURPOSE: To create a 3D model of the architecture of VMO and to characterize the bony and soft tissue attachments of the FBs. METHODS. The FBs of VM attaching to the medial aspect of patella were exposed in three formalin-embalmed cadaveric specimens. A Microscribe® 3DX digitizer was utilized to obtain coordinates of the patella, femur, tendon of adductor magnus (AM), and FBs of VMO. The data was modelled in Autodesk® Maya® 2011. The FB length and attachment sites were documented throughout the volume of VMO. RESULTS. On average, 150 FBs of VMO were digitized in each specimen. The FBs that attach most distally on the medial aspect of patella form a thin layer, and have the shortest length (40.9 ± 5.6mm) when compared to the remainder of VMO (67.3 ± 15.5 mm). The attachment sites of the superficial and deep FBs are staggered, with the superficial FBs
extending from, or slightly anterior to, the medial intermuscular septum to an aponeurosis that attaches to the medial border of patella. The deep FBs originate more posteriorly on the inferior part of the tendon of AM, and do not extend to the patella, but attach to aponeurotic structures of the knee joint, posterior to the medial edge of patella. CONCLUSIONS. All the FBs of VMO do not attach to the patella directly. This finding may have an impact on current rehabilitation protocols involving VMO activation in the management of patellar dysfunctions.

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Interosseous membrane of the leg: The anatomic basis for combined ankle and common fibular (peroneal) nerve injuries/lesions.

INTRODUCTION. Common fibular nerve (CFN) palsy has many etiologies. A rare cause with a poorly understood pathophysiology is CFN palsy (either entrapment or an intraneural ganglion cyst) that follows an ankle injury. METHODS. Five patients are presented who developed CFN palsy immediately following ankle injury: 3 developed injuries to the CFN at the fibular neck; and 2, fibular intraneural ganglion cysts arising from the superior tibiofibular joint. High resolution MRIs of the entire leg in these affected individuals were performed to assess the integrity of the interosseous membrane (IOM), and characterize the CFN and its terminal (deep, superficial and articular) branches. RESULTS. MRIs showed evidence of injury to the IOM in all 5 cases. Furthermore, the CFN, including its branches, specifically the articular branch, was hyperintense and enlarged in all cases and cystic in the 3 with intraneural ganglion cysts. CONCLUSIONS. These cases provide anatomic and radiologic evidence to support a hypothesis that the IOM provides the basis for this combined pattern of injury. Torsion at the ankle with resultant force translation along the IOM produces tension/traction to the CFN which may produce neuropathy or cyst intraneural formation. This theory unifies previously postulated mechanisms and demonstrates the role of indirect trauma in the pathogenesis of neuropathy.

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Enhancing the anatomical knowledge of clinical phase medical students using a novel interactive electronic teaching package.

INTRODUCTION. Over recent years the quantity of anatomy teaching in UK medical degree programmes has declined and there is little formal opportunity for students to refresh their anatomical knowledge during the clinical years. This has led to a reduction in student knowledge and ability. The present study investigated the development and use of a clinically-focused electronic teaching package as an engaging method of enhancing the anatomical knowledge of clinical-phase medical students. METHODS. A pilot questionnaire investigating student learning needs and preferences was sent to 1000 clinical-phase students at the University of Nottingham and the results (9% response rate) were used to guide the production of a teaching package using Articulate Studio. The pilot package focused on venous catheterisation. It provided a non-linear interactive learning experience that was accessible via PC, Mac and mobile device. Evaluation was performed via questionnaire and focus group. RESULTS. The package was well received and students reported it increased their anatomical knowledge, filled gaps in their training and provided them with a safer understanding of the anatomy underlying the described clinical procedures. Interactivity, sequential images of cadaveric dissection, interactive surface anatomy images, clinical procedure videos/details and self assessment were identified as essential components. CONCLUSION. Clinically-focussed electronic teaching packages provide a novel, engaging and time efficient method of addressing the lack of anatomy training during the clinical-phase of a medical degree. A set of best practice guidelines for the production of such teaching packages are described.
TURNER, Benjamin, Alesha PRIOR, Timothy ROACH, Deon FORRESTER, R. Shane TUBBS, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. Endocardiac endoscopic lead extraction - a cadaver feasibility study.

INTRODUCTION. Lead extraction is an increasingly common procedure reflecting the rising number of cardiac pacing/defibrillator system implants. This has led to the development of several lead extraction techniques. Unfortunately, none of these techniques are free from complication. These include infection, or risk of lead fracture. Considering the difficulty and possible complications involved in exposing the pacemaker lead, an endoscopic endocardiac approach was employed. METHODS. For this technique, 50 adult human hearts with permanent pacing leads were examined. RESULTS. Measurements revealed an adequate working space within the right ventricle. With regards to lead extraction, it was observed that the posterior and septal leaflets of the tricuspid valve were thickened in variable degrees. In 5 hearts, false tendons were identified. In 10 hearts, the moderator band was large enough partially cover the end portion of the lead. In the vast majority of the hearts (48), the tip of the electrode was embedded within the septomarginal trabeculation which at this point was fibrotic. CONCLUSIONS. Irrespectively of the aforementioned observations, under the guidance of an endoscope the lead extraction was very simple. Considering that none of the surgical procedures currently used is without complications, our newly proposed techniques could theoretically reduce complications.

VAN SCHOOR, Albert-Neels, Marius C. BOSMAN, and Adrian T. BOSENBERG. 1Department of Anatomy, University of Pretoria, Pretoria, South Africa. 2Department of Anesthesiology, Seattle Children’s Hospital, Seattle, WA 98105, USA. Infraclavicular brachial plexus blocks – Comparison of neonatal and adult anatomy.

INTRODUCTION. The infraclavicular (IC) block has been designed to effectively block all the cords and branches of the brachial plexus (BP). However, the majority of studies done on pediatric patients use techniques that was initially designed for adults. This study aims to describe the anatomy of the pediatric BP, to determine an improved needle insertion site for the IC block using constant bony landmarks and, finally, to compare the data obtained from the pediatric study to that obtained from a similar adult study. METHODS. Both axillae of a sample of 52 neonatal (52 left and 50 right) and 75 adult (74 left and 70 right) cadavers were dissected and used in the study. RESULTS. No significant differences were found when comparing the left and right sides. The data for both sides of each sample were combined for a total of 102 neonatal and 144 adult axillae. The distances of the lateral and mediacal cords of the BP were measured from the coracoid process (CP) on a line between the CP and the xiphisternal joint (XS). The ideal point of needle insertion (a point halfway between the lateral and mediacal cords) was also determined. These measurements were converted to a percentage of the distance of the line between the CP and XS (CP-XS line) and compared. Statistical analysis of the data showed that there were significant differences between the percentages obtained when comparing the neonatal and adult samples. Two distinct regression formulae were developed in order to predict the ideal point of needle insertion (dependent variable) with the CP to XS line distance as the independent variable. CONCLUSION. It is clear from this study that children are not small adults and caution is advised when performing pediatric blocks that were developed for adult populations.

WEINHAUS, Anthony J. and Mark S. COOK. Department of Integrative Biology and Physiology, University of Minnesota, Minneapolis, MN 55455, USA. A redesigned Embryology course with practical exams and a lab featuring fetuses and embryos.
INTRODUCTION. Over the past decade, time spent by first-year medical students in Embryology has experienced reduced hours, and eventually went completely on-line at our institution. In response to strong student dissatisfaction and declining performance, the course was redesigned. The course continued to receive very few contact hours. Thus, a laboratory practical exam in Embryology was introduced to help achieve the goals of the course which were to teach the foundations of embryology, and to use embryology to explain difficult definitive morphology. METHODS. The new course consisted of 9 hrs of live lecture, written exams, a lab, and practical exams. The lab is integrated with the gross anatomy lab. Cadaveric structures are tagged and students are expected to correctly answer questions about the embryological origin. In addition, students observe our collection of 2 embryos and 27 fetuses in order to learn to determine size, age and landmark structural and functional changes. RESULTS. Students in the redesigned embryology course (N=170) performed significantly better (on a more rigorous written exam) than previous years. In addition, student performance on written and practical exams was equal to or better than their performance in the concurrent Gross Anatomy course. Student surveys (anonymous, on-line, Likert-scale, N=130) show that students feel strongly that both the written and practical exams in embryology helped to accomplish the course goals and suggested that the practical exams added great interest to learning embryology and praised the embryo and fetal collection as an invaluable experience. CONCLUSIONS. A redesigned embryology course was extremely successful despite very few student contact hours.

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Visualization of stellate ganglion local neuronal density remodeling in chronic MI.

INTRODUCTION. Chronic myocardial infarction (MI) is associated with neuronal hypertrophy of large neurons (>500 µm²) and increased synaptic density, but without concomitant changes in overall neuronal density or nerve sprouting, in the cervicothoracic (stellate) ganglion of humans. In this study, we compared local densities of small (<350 µm²), medium (351-500 µm²), and large neurons of normal and chronic MI stellate ganglia. METHODS. We harvested stellate ganglia from both sides of ten [4 F and 6 M; age 79.1(3.50) years], embalmed human cadavers (6 infarct, 4 normal, IRB exempt). Ganglia were serially sectioned in the coronal plane (10 µm) and stained with luxol fast blue and cresyl violet for visualization of white matter fibers and neurons, respectively. A representative slide from the middle of each ganglion was digitally scanned using the Aperio Scan Scope system (Vista, CA). Neurons were categorized by size using an automated threshold algorithm. Maps for each size category were plotted using Adobe Photoshop CS5 (Adobe Systems Inc.). Density maps were created using a nearest neighbor approach in MATLAB (The MathWorks, Inc.). In addition, we used a factorial ANOVA statistical model in Stata 10.1 (StataCorp) to test for relationships between overall neuronal density or neuronal size with cohort, age and side. RESULTS. Local density heat maps revealed local clustering of large neurons. Neither overall neuronal density [F (3,16) = 1.17, P = 0.35] nor neuronal size [F (3,16) = 1.33, P = 0.30] were significant in either statistical model. CONCLUSION. Our study demonstrated that large neurons cluster locally, which may be part of the remodeling process in response to chronic MI. (This work was made possible by support from the NHLBI (R01HL084261) to KS.)
Abstracts – TechFair Presentations
(listed by presenting author last name)

CASPER, Ryan J. and Neil S. NORTON. Department of Oral Biology, School of Dentistry, Creighton University, Omaha, NE 68178 USA.
Development of a 3D learning resource of the pterygopalatine fossa using cone beam computed tomography for dental students.

INTRODUCTION. The pterygopalatine fossa is a pyramidal shaped fossa located between the infratemporal fossa and the nasal cavity. The major contents include the maxillary division of the trigeminal nerve, the pterygopalatine ganglion, and branches of the 3rd part of the maxillary artery. The fossa is very difficult for students to visualize in textbooks and the gross laboratory. The increasing use of cone beam computed tomography (CBCT) in dentistry has increased the ability of dental clinicians to visualize anatomical structures in multiple dimensions. The purpose of this study was to develop a 3D learning resource of the pterygopalatine fossa using CBCT for dental students. METHODS. Anonymized CBCT files were selected from a series of patients with normal anatomy. All of the scans had been performed at 0.3 mm resolution and were reconstructed using Osirix version 3.9.2 in axial, coronal, and sagittal planes. Digital images of a dry skull and cadaveric dissection of the pterygopalatine fossa were collected using a Canon Powershot ELPH 100 HS. Final Cut version 10.0 was used to create a multimedia learning resource. RESULTS. A multimedia learning resource for the pterygopalatine fossa was created using CBCT videos, CBCT images, cadaver photographs, and skull photographs. The CBCT videos and images incorporated axial, sagittal, and coronal planes of the pterygopalatine fossa. Labeled and unlabeled cadaver and skull photographs were utilized. Audio was integrated to explain the clinical relevance of the anatomy of the pterygopalatine fossa. CONCLUSIONS. This learning resource provides dental students a tool to augment their understanding of the anatomy of the pterygopalatine fossa.

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Using a blended learning environment to enhance courses in a professional curriculum.

INTRODUCTION. Current classroom technologies are threatening attendance/involvement in professional curricula as students feel stressed about time management and the value of attending lectures. This presentation outlines the blending of numerous evolving educational trends to reduce in-class time while stimulating student involvement both individually as well as in groups. METHODS. Integration of numerous educational technologies, old and evolving, facilitates the creation of a learning environment that incorporates many different forms of activities all linked to, or housed within, a typical curriculum-management host like BlackboardTM that result in a highly interactive individual and group learning experience that has multi-use potential on- and off-site. RESULTS. Each educational session involves short mp4 videos from ECHO 360 Personal CaptureTM that demonstrate annotations to stress critical information, stand-alone lecture sections, progress-assessment quizzing, animations and videos, a lab component accomplished individually or in groups, and a TBL session to interrelate basic science and clinical aspects on the topic – which can be done locally or in a distance learning scenario using Adobe ConnectTM. The instructor can utilize electronic office hours to interface with students individually or with their study/working groups. Issues are resolved orally or by screen-sharing and annotation. CONCLUSIONS. Learning experiences using a blended approach reduce classroom lecturing and increase student interactivity either individually or within self-selected or instructor-assigned small groups facilitating use in multi-site programs and
in online program prerequisites as more basic science courses are repositioned outside the professional curriculum.

SALKOWSKI, Lonie R., R. Benjamin SHAPIRO, Greg VAUGHAN, Aaron BAHR, Allison SALMON, Brian PELLETIER, Jake RUESCH, and Kurt SQUIRE. University of Wisconsin School of Medicine and Public Health, Department of Radiology; Wisconsin Institutes for Discovery, Educational Research Integration Area; and University of Wisconsin, School of Education, Department of Curriculum and Instruction, Madison, WI 53792, USA.

Anatomy Pro: Tracts – An iPad game to teach gastrointestinal anatomy and its clinical implications.

INTRODUCTION. The anatomical, regional and functional anatomy of the gastrointestinal tract is difficult for medical science students to learn. Direct visualization in an anatomical dissection lab or surgical arena is currently the best method to learn this anatomy. These experiences are not available to all students who need to learn the gastrointestinal tract. Hands-on experience is short lived and not transportable for future reference. We are developing and researching an interactive, clinically based video game, Tracts, that will take the learner from basic anatomical fundamentals to medical image-based applications. METHODS. Tracts is an iPad game that begins with organ and regional 3D idealized anatomy, and then progresses to multi-planar CT images. Users role-play a doctor who must diagnose and treat digestive disease cases using CT imaging technology. The main narrative is supplemented with an interactive 3D anatomical atlas, and puzzle games that focus on anatomy reconstruction and CT interpretation. The anatomical principles within the Tracts simulation program build upon each other as the learner progresses through the program. CONCLUSIONS. The Tracts iPad application builds on design methodologies and processes from the commercial, entertainment gaming sector and applies them toward modeling complex issues in gastrointestinal anatomy and clinical implications by making complex principles and concepts ‘visible’ to the learner. (Sponsored by UW Graduate School Fall 2011 Research Competition and Philips Healthcare/RSNA Education Scholars Grant.)

WINESKI, Lawrence, Patrick ABRAMSON, Jinjie ZHENG, and Rebecca SEALAND. Department of Pathology and Anatomy, Division of Information Technology, Morehouse School of Medicine, Atlanta, GA 30310, USA.

Introduction to radiology of the back.

INTRODUCTION. Ongoing reductions in curricular contact hours plus increased expectations in knowledge base (e.g., in medical imaging) create an increasing need for educational tools that supplement traditional classroom sessions and aide in independent learning. METHODS. We have created an interactive electronic program on the radiology of the back that offers a means of delivering structured information while simultaneously allowing students flexibility in pacing their studies and managing schedules. RESULTS. Medical images (conventional plain films, CT, MRI) of the back are presented with matching images of the skeleton to orient the viewer. "Labels On" and "Labels Off" features related to a master list of structures allow study, review, and self quizzing. More advanced self-testing media (e.g., national board format questions) and score tracking mechanisms provide ongoing gauges of the user's learning progress. CONCLUSIONS. This program substitutes for traditional lab sessions in osteology and radiology that have been lost due to curricular time restraints. It provides students an outline of learning expectations combined with strong audiovisual aids, and allows students the opportunities for self-paced and independent learning. (Supported in part by NIH PO3 1B04017 and G12-RR03034)
Abstracts – Poster Presentations Session 1
(listed by presenting author last name)

ARAKAWA, Takamitsu1,3, Zhi LI1, Robert BOBOTSIS1, Dongwoon LEE2, and Anne AGUR1.
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Three-dimensional architecture of the plantar intrinsic muscles of the foot.

INTRODUCTION. The plantar intrinsic muscles provide active support for the arches of the foot and when weakened may contribute to arch pathologies. Muscle models have been used to study arch instability and have usually represented the intrinsic muscles as a series of single or multiple line segments without considering musculotendinous architecture. PURPOSE. To construct, at the fiber bundle level, a prototype, volumetric 3D model of the detailed musculotendinous architecture of the plantar intrinsic muscles of the foot. METHODS. Twenty-one plantar intrinsic muscles were digitized in situ from one formalin embalmed cadaveric specimen. Digitization (MicroscribeTM G2DX Digitizer) was carried out at the fiber bundle level and also included tendons, aponeuroses, muscle attachments and the bony foot. Autodesk® Maya®, with additional plugins developed in this laboratory, were used to reconstruct the data into a 3D model and to quantify muscle architecture. RESULTS. Using this technique, a detailed model of the musculotendinous architecture of the foot was constructed. Fiber bundle length, pennation angle, muscle volume and physiological cross sectional area was quantified for each of the twenty-one muscles. This architectural database can be used to compare the architectural / functional characteristic of the intrinsic muscles of the foot. CONCLUSIONS. This prototype model and the extensive parametric database created in this study from one cadaveric specimen is proof of concept that this methodology provides a more comprehensive understanding of the musculotendinous architecture of the foot than has been previously possible. This prototype may be further developed into a contractile model that could enable normal and pathologic movement analysis.

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Anatomy relevant to neonatal caudal and lumbar epidural anaesthesia.

INTRODUCTION. Many anesthesiologists not used to working with pediatric patients may lack the knowledge of relative depths or position of key anatomical structures, as it is known that the anatomy of children differ to some degree from that of adults. A thorough knowledge of the anatomy of pediatric patients is therefore essential for safe and successful performance of epidural blocks. The aims of this study were to observe and quantify the important landmarks and structures, associated with both the lumbar and caudal epidural blocks. METHODS. The vertebral column of 40 neonatal cadavers was dissected. Observations were then made and measurements taken of the neonatal vertebral columns in both a prone and flexed position. Information regarding the vertebral level and distance from the apex of the sacral hiatus (ASH) to the L1/L2 to L5/S1 interlaminar spaces, Tuffier’s line (TL), the conus medullaris (CM) and the dural sac (DS), were taken. RESULTS. On average, the CM was found to be at the middle third of the L2 vertebra. The distance from the ASH to the CM was between 36.0-41.6mm when prone and 41.0-48.9mm when flexed. TL was found to be at the L4/L5 interlaminar space when prone. When flexed, this level moved caudally, ending at the upper third of L5. In all cases the DS was found to be within the caudal space. On a prone cadaver the distance from the ASH to the DS was between 8.9-11.8mm. This increased to 10.5-13.0mm when flexed. CONCLUSION. This study hopes to complement what is already known of the neonatal vertebral column and to shed
some light on the changes that occur when the neonate is flexed during the conduction of either single-shot lumbar or caudal epidural blocks, or for the insertion of a continuous epidural catheter via the caudal or lumbar route.

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Intramuscular innervation: A methodological approach using digitization and 3D modeling of three different muscles.

INTRODUCTION. Modeling of muscle volume and intramuscular innervation patterns using digitization creates 3D documentation of visible intramuscular nerves. Capture of 2D muscle architecture and neural distribution patterns made interpretations of nerve branching within the muscle volume difficult. The purpose of this study is to demonstrate how 3D digitization enhances visualization of the intramuscular innervations of soleus, gastrocnemius and supraspinatus (SP) muscles. METHODS. The intramuscular innervation pattern of the suprascapular nerve branches and tibial nerve branches in supraspinatus and soleus/gastrocnemius respectively were digitized by sequentially exposing and digitizing short segments of the nerve. A Microscribe 3D-X digitizer was used to digitize discrete points in approximately 1mm increments along the nerves. Concurrently with nerve digitization, the surface of the muscle was digitized to obtain a database of the muscle volume. Autodesk® Maya® 2011 was used to construct the 3D model of intramuscular innervation from the digitized data consisting of Cartesian plane coordinates. The models were used to analyze the intramuscular innervations of each muscle, and the results from this methodology compared with previous 2D studies. RESULTS. 3D modeling allowed the tracking of the nerve distribution within the muscle volume. These in situ models are comprehensive representations of the actual specimens, rather than previous serial dissections, where the specimen is no longer intact and volumetric relationships difficult to determine. CONCLUSIONS. Digitization and 3D modeling provides an accurate way to create a database of intramuscular nerve distribution, as in situ. These 3D models can be stored and reliably used for future anatomical and clinical studies.

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Redefining Pitanguy’s Line: A three dimensional analysis of the fronto-temporal branch of the facial nerve.

INTRODUCTION. The fronto-temporal branch of the facial nerve (FTN) is vulnerable to injury during craniofacial surgeries due to its superficial course (Gosain et al., 1997). Surface landmarks of the face that correlate with the underlying course of the FTN can assist in surgical planning. Current estimates of the course of the FTN commonly rely on Pitanguy’s line, a line drawn from a point 0.5 cm inferior to the tragus to a point 1.5 cm superior to the lateral border of the eyebrow. While regarded as a predictor of the course of the FTN, no study has assessed this landmark using 3D analysis. The purpose of this study was to evaluate the accuracy of Pitanguy’s line in predicting the course of the FTN using 3D modeling. METHODS. Pitanguy’s line was demarcated and digitized using a Microscribe™ digitizer in ten cadaveric formalin embalmed specimens. A preauricular flap was raised using a modified Blair incision and branches of the FTN were isolated and digitized using a retrograde dissection to the origin of the nerve trunk. The digitized data were reconstructed into 3D models using Maya®, and used to determine distances between Pitanguy’s line and the FTN. RESULTS. In contrast to Pitanguy and Ramos (1966), the FTN was observed to divide into a variable number of branches and was distributed throughout the temporal region. While Pitanguy’s line approximated the course of the distal terminal branches
of the FTN, preliminary observations indicate a discrepancy between the proximal landmark for this line and the origin of the nerve trunk. CONCLUSIONS. Accurate surface landmarks identifying the course of the FTN are required for planning craniofacial surgeries. Discrepancies in surgical landmarks may result in potential risk of nerve injury during approaches to this region.

HILLMAN, Daniel, Theofanis KOLLIAS, Robert G. LOUIS Jr, Anthony V. D’ANTONI, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George’s, Grenada, West Indies. Mapping the contributions of the furcal nerve.

INTRODUCTION. Lumbosacral radicular symptoms may involve the furcal nerve, 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. METHODS. One hundred formalin-fixed cadavers were examined. The connections between the lumbar plexus and the sacral plexus were examined bilaterally. RESULTS. In 95% of our specimens, the furcal nerve joined the two plexuses. Anatomical variations of the furcal nerve were classified into Types I to V with respect to their origin. A single furcal nerve arose from L4 (Type I) in 64% and L5 (Type II) in 16% of the cases. A doubled furcal nerve arose from L3 and L4 (Type III) in 7.5%, from L4 and L5 (Type IV) in 4.5% and from L3–L5 (Type V) in 3% of the cases. The furcal nerve divided variably into anterior, intermediate and posterior root fibers. The anterior and intermediate roots of the furcal nerve traveled to join the lumbar plexus (femoral and obturator nerves) and the posterior root continued to join the lumbosacral trunk. In 5% of cases, no connection between the plexuses could be found. CONCLUSIONS. Variations in the furcal nerve may contribute to atypical presentations of lumbar radiculopathy. These data could prove useful in evaluating the etiology of lumbosacral radicular syndromes.

LAMBERT, H. Wayne, Jacob N. FOX, Stavros ATSAS, Sean C. DODSON, Blake T. DANAGEY, Patrick M. KENNEDY, and Heather J. BILLINGS. West Virginia University, Morgantown, WV 26506, USA. Variant leg muscles associated with the ankle joint: Clinical implications and photographic evidence.

INTRODUCTION. Variant muscles associated with the ankle joint have gained recent attention in the clinical literature. In this study, four different variant muscles were identified, including the: 1) fibularis quartus, 2) fibulocalcaneus (peroneocalcaneus) internus (PCI), 3) flexor digitorum accessorius longus (FDAL), and 4) anterior fibulocalcaneus. METHODS. 237 cadaveric legs were dissected to identify, measure, photograph, and document these muscles. The literature was reviewed to summarize their clinical implications. RESULTS. Approximately 20% of dissected limbs contained a fibularis quartus muscle, including two rare variants, peroneocuboideus and peroneocalcaneocuboideus. One rare example of the PCI muscle was present in these dissections, which provided the first gross anatomical photograph of this muscle. One FDAL muscle was identified, along with seven examples of the anterior fibulocalcaneus muscle, first reported in 2010. CONCLUSIONS. Variant ankle muscles were identified and photographed and their clinical implications will be discussed. Fibularis quartus muscle variants can cause lateral ankle stenosis, ankle instability, fibular tenosynovitis, and subluxation of the fibular tendons. The PCI muscle has been implicated in posterior ankle pain/impingement and even tarsal tunnel syndrome. The FDAL muscle is more frequently involved with tarsal tunnel syndrome, but can also cause flexor hallucis longus tendinopathy. The anterior fibulocalcaneus muscle was discovered in this study, and currently biometric and radiologic studies are underway to confirm the actions and prevalence of this muscle. Radiologists and clinicians should be aware of these muscles when embarking in diagnosis and imaging interpretation, especially when chronic ankle pain is involved.
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Perspectives on an inquiry-based learning strategy designed for a large-scale human anatomy course.

INTRODUCTION. Inquiry-based learning (IBL) has been identified as an effective strategy for active learning. The intention of this technique is to encourage students to be responsible for their learning by generating questions, performing research, and proposing solutions. Knowledge is said to develop actively through discovery rather than passively through transfer from a higher authority. While active-learning strategies have been utilized broadly for professional-level training, similar opportunities remain rare in large-scale, pre-professional anatomy education. This study describes the adoption of IBL in a large-scale second-year human anatomy course as a term-long, team-based research project, and reports perceptions of its learning utility from the vantage of students and project facilitators. METHODS. Students were organized into groups and required to propose, research, and resolve an anatomical question of their choosing, with guidance from an experienced facilitator. Students presented their work at a year-end symposium. Assessment surveys were administered at the conclusion of the project. RESULTS. Responses from students suggested that inquiry-based learning was most useful for developing teamwork skills and achieving personal goals; while facilitators implied that inquiry was most beneficial for deep and active learning. Although the perceived benefits of IBL differed between the two groups, the overall reaction was positive for all participants. CONCLUSIONS. These observations offer a favourable view of IBL as presented here and support the integration of active-learning methods in large-scale, undergraduate anatomy courses to augment student learning and to expose perspective instructors to active-learning strategies at the pre-professional level.

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Determining airway acid production in living cells in vitro using confocal microscopy.

INTRODUCTION. Airway acid production has been described in Cystic Fibrosis (CF) and Asthma. While pH changes are recognized modifiers of epithelial signaling, mucus properties, bacterial defenses, and induction of immune responses, the correlation of acid production to cellular dysfunction is limited by the robustness of the technique used to detect and quantify them in real time. Confocal microscopy (CM) integrates multiple focal planes, and is therefore capable of greater sensitivity and resolution than traditional imaging. We hypothesized that CM is a powerful approach for detecting small but potentially relevant pH changes as they occur in real time in living cells. METHODS. Airway epithelial cells derived from a primary cell line (JME) of a CF patient were treated with the pH reporter dye SNARF-5 (5 uM, Invitrogen), and imaged via CM. A series of pH calibration points (pH 5, 6, 7, 8) was performed for each experiment (n=4), and pH calculated from the ratio of SNARF-5 emissions for acidic and alkaline values as previously described [(H+) = Kd (Rmax-R/ R-Rmin) in 10 randomly selected cells. RESULTS. Baseline pH was determined (6.74 +/- 0.07) and cells perfused with buffer containing Amiloride (0.5 mM, blocks Na+/H+ exchanger) and ZnCl2 (0.01 mM, a proton channel blocker) or ionomycin (0.2 mM, a Ca2+ mobilizer) to promote intracellular acidity or alkalinity, respectively. Amiloride/ZnCl2 treatment significantly reduced the intracellular pH to 6.52 +/- 0.10, while ionomycin treatment significantly increased it to 6.90 +/- 0.11. CONCLUSIONS. We conclude that CM is an appropriate and powerful method for measuring intracellular pH in living cells and will be utilized in future studies to elucidate the relationship between acid production and airway epithelial dysfunction.

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A volumetric study of the mandibular canal in dentulous patients using cone beam computed tomography.

INTRODUCTION. Cone beam computed tomography (CBCT) has been of significant use in the treatment of many dental and maxillofacial procedures. There is little reported in the literature involving volume of the mandibular canal. The purpose of this study was to utilize the 3D capabilities of CBCT to examine the volume of the mandibular canal in dentulous patients. METHODS. Anonymized CBCT files of dentulous (n=23) patients were selected. All of the scans had been performed at 0.3 mm resolution and were reconstructed using Osirix v3.9.2. The region of the mandible in which the canal’s volume was calculated ran from the posterior aspect of the mental foramen to the anterior portion of the ascending ramus. The canal was demarcated with an area of reference for volume calculation every 0.6 mm. To compare volumes, measurements of the mandible were recorded at the lowest vertical dimension between the ramus and the mental foramen, and in the horizontal dimension from gonion to the foramen. RESULTS. Mandibular canals were observed in all of the scans. Measurements revealed that the average distance between the mental foramen and gonion was 5.70 cm and the average lowest vertical distance between the ramus and the mental foramen was 2.26 cm. The average volume in the mandibular canal was 0.1119 cm³. A significant decrease was observed in the volume of the mandibular canal. In the area 4.2 mm posterior to the mental foramen and the mental foramen, the volume was 0.0118 cm³. The remainder of the mandibular canal had a volume of 0.127 cm³. CONCLUSIONS. This study suggests that the volume of the mandibular canal is consistent until it reaches 4.2 mm posterior to the mental foramen where it significantly decreases.

MACKENZIE, Les W., Ron EASTEAL, Stephen C. PANG, and Conrad REIFEL. Department of Biomedical and Molecular Sciences, Queen's University, Kingston, Ontario, Canada K7L 3N6. Training human anatomy teachers: An educational track master's degree program in anatomical sciences.

INTRODUCTION. Human anatomy is a foundational component in Health Professional and Life Sciences based curricula. The Department of Biomedical and Molecular Sciences offers an M.Sc. program in Anatomical Sciences focused on educating and training students to teach human anatomy at the college or university level. METHODS. This program is structured around three basic pillars of post-secondary education: Content, Pedagogical and Inquiry Competence. The students are provided with in-depth courses in the four anatomical disciplines together with courses on teaching and learning in higher education. The practicum provides the students with hands-on experience in dissection, techniques in specimen preparation, histology techniques, electronic media, digital imaging technology for anatomical sciences and classroom (both large and small) and laboratory teaching in undergraduate and graduate courses. The students also complete an independent study with project topics selected from areas in Anatomy and Cell Biology, Pedagogy in Anatomical Sciences or Instructional Technology. RESULTS. To date we have graduated 68 students, all of whom have found employment; some in teaching/technical positions in human anatomy at colleges and universities nationally and internationally, some as educators in the private business sector, and others have continued their education at a higher level (allied health professional, M.D. or Ph.D. programs). This program has been received positively by senior administrators in the Faculty of Health Sciences, Queen’s University and external consultants. CONCLUSION. Our program in Anatomical Sciences graduates master’s level qualified individuals capable of teaching all anatomical disciplines to undergraduate, graduate and professional students.
INTRODUCTION. High take off coronary arteries and anomalies of the coronary ostia have been associated with sudden cardiac death. However these conditions are often asymptomatic and their diagnosis is difficult. Of particular interest is the degree of angle between the coronary ostia and the aortic root. Considering the difficulty and possible distortions of the aortic root and angle of coronary ostia during dissection, an endoscopic endocardiac approach was employed. The aim of this study was to assess the variations of the angle of the coronary arterial orifices. METHODS. We examined 100 adult cadaveric hearts with the aid of a 5mm 0 degrees flexible and rigid Stryker endoscope. RESULTS. The right coronary artery (RCA) and the left coronary artery (LCA) arose superior to the sinotubular junction (SJ) in 10% and 7% of the cases of respectively. The RCA and LCA orifice were perpendicularly oriented to the aortic wall in 90% of the specimens with a mean angle of 56 degrees. In the remaining 10% of specimens the angle between the coronary orifice and the longitudinal axis of the aorta had a range between 25-58 degrees. CONCLUSION. According to several reports coronary arterial orifices with <45 degrees angle are considered to be high risk for sudden cardiac death. This may lead to further clinical application such as MRI detection of the angle of coronary arterial orifices especially in young population.

MATUsov, Yuri, Benjamin C. Hugo, Vicente VAzquez, Trushar Rathod, and Kristjan L. Thompson. Ross University School of Medicine, Portsmouth, Dominica, West Indies. A classic case of oat-cell carcinoma of the lung: Anatomic and histologic presentation with current therapeutic approaches.

INTRODUCTION. Lung cancer remains the most common and deadliest cancer worldwide; small-cell lung cancer (SCLC) has the poorest prognosis. The authors discuss a classic case of oat-cell carcinoma, the most common SCLC subtype, by way of a cadaveric case presentation. METHODS. A widely-disseminated metastatic lung cancer was discovered incidentally in an 82-year-old female cadaver. Tissue samples were taken from the suspected primary and metastatic sites and histologically dehydrated, fixed, embedded in paraffin and cut at 5microns. Staining was performed with hematoxylin and eosin (H&E) and the resulting tissue cuts were assessed by a pathologist. RESULTS. The exact primary location could not be conclusively determined due to dramatic involvement of nearly the entire right lung, portion of the right diaphragm, hilar lymph nodes, and pleura. Staining showed numerous small cells with round nuclei and poorly differentiated cytoplasm and frequent mitoses, consistent with metastatic oat-cell bronchogenic carcinoma. There were suspected distant metastatic sites but these were not available for sampling. SCLC is a disease with poor prognosis, high mortality and high chemoresistance with prevalent metastatic disease that is best treated with systemic chemotherapy; however, current standard of care is inadequate and there are few investigational prospects for new drugs. CONCLUSIONS. Lung cancer will continue to remain a major public health issue, particularly among patient populations with high rates of smoking and exposure to environmental toxins. In this patient, disease presentation at autopsy suggests an extremely aggressive neoplasm invading much of the right hemithorax. It is clear that novel systemic therapeutic approaches are needed in combating this devastating disease.

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INTRODUCTION. The latissimus dorsi is one of the muscles most often used for transplantation in reconstructive surgery. Recently, reanimation of facial paralysis is often performed using a transplant from the latissimus dorsi. However, functional evaluation after the operation shows inconsistent results. This is caused by a lack of anatomical knowledge of the paths of thoracodorsal nerve and artery. So, we wanted to clarify the thoracodorsal nerve and artery distribution in the latissimus dorsi. METHODS. By using 15 preserved cadavers, nerve distribution in the latissimus dorsi was investigated using Sihlar’s staining method. In 5 of the tissues silicon rubber (Microfil) was injected in the thoracodorsal artery during the clarifying process. RESULTS. We divided the latissimus dorsi was divided into nine regions by dividing it into three regions from the beginning to the end and again into three regions from the upper side to the lower side. And it was labeled A1~A3 going from the upper side, B1~B3 across the middle, and C1~C3 along the lower side. The thoracodorsal nerve branched into two or three. The region in which the nerve entered the muscle was usually in the B region. The thoracodorsal artery almost always ended in the B regions. On the other hand, the thoracodorsal nerve almost always ended in the C region. CONCLUSIONS. The thoracodorsal nerves divided into two or three branches. The branches of the thoracodorsal nerve usually ran parallel to the branches of the thoracodorsal arteries in the A and B regions in which the nerve entered the muscles. The end of the thoracodorsal artery almost always ended in the B region. But the extent of nerve endings that could be viewed usually ended in the C area that was formed the intercostal artery perforators.

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Changes in critical thinking vs. performance of medical students progressing through gross anatomy.

INTRODUCTION. Critical thinking (CT) skills are correlated with success in medical school. We examined the relationship between CT skills and exam scores in a regional dissection-organized gross anatomy course. METHODS. The Watson-Glazer Critical Thinking Assessment (WGCTA) was given to 438 freshman medical students during orientation in 2011-2013. Total WGCTA and subtest scores were compared to written and lab practical grades in each unit for all students as well as in the high (HCT), middle 3/5 (MCT) and low (LCT) quintiles. RESULTS. A significant correlation existed between total WGCTA scores and performance in both written and practical exams with the recognition of assumptions (RA), deduction (DED), and interpretation (INT) subtest skills accounting for the significance. The inference and evaluation of arguments CT skills had no correlation. Interestingly, the RA and DED skills of MCT students were correlated with written exams, while the DED and INT skills of LCT students were important on practicals. The CT skills of HCT students had no significant correlation. The WGCTA total and subtest skills were correlated with performance in the first two units (upper limb/back; thorax) and the last two conceptually more difficult units (pelvis/perineum; head/neck). CONCLUSIONS. Different CT skills are important for academic performance in written and practical gross anatomy exams depending on the initial CT level of matriculating students. Students rely on CT skills during their initial exposure to the discipline and when exposed to conceptually difficult material at the end of the course. These results highlight the need for curricular changes that target acquisition of specific CT skills early in medical education. (Sponsored by MEFFA and the COM Dean’s Office.)
INTRODUCTION. This study was conducted to evaluate variations in the deltoid ligament (DL) of the ankle. METHODS. Dissection of the DL in 33 ankles of 17 formalin-fixed cadavers was performed and revealed various ligamentous bands. The length, width, and thickness of the bands were recorded with a digital caliper and some sectioned for histologic analysis. RESULTS. Mean age at death was 76.6 years (range 55 to 103). Eight different DL bands were found and the complex was present in superficial and deep layers. Five bands consistently found were: tibiocalcaneal (TC), tibionavicular (TN), anterior tibiotalar (ATT), superficial posterior tibiotalar (sPTT), and deep posterior tibiotalar (dPTT) bands. The longest band was the TN (mean length, 30.59 mm) and the shortest was the ATT (mean length, 10.24 mm) of the 5 bands. The morphology of the spring ligament (SL) band varied: in 15 ankles the bands' length was distinguishable, whereas, in others, the SL band was inseparable from TN or TC bands. However, fibers of the DL attached to the SL. Two unique bands were found: one deep to tibiocalcaneal (n=4) and a band attaching posterior to the sustentaculum tali (n=2). RESULTS: dPTT and SL bands became narrower and the TC band became shorter with increasing age. SL band width showed the strongest inverse association with age (Spearman rho = -0.649, p = 0.007). Males had wider TN and longer dPTT bands compared to females (Mann-Whitney U test, p = 0.015 and 0.049, respectively). The sPTT tended to be longer in males (p = 0.053). CONCLUSIONS. Although these data build upon those of previous studies, we report additional variations. Changes in the DL over time should be further investigated. Our results should help surgeons and other clinicians better treat diseases of the ankle.
intramuscular. The SN was observed to be in direct contact with the superficial aponeurosis of
piriformis and the bony ischial spine in all 5 specimens leaving the SN in a vulnerable position as it
exits the pelvis. CONCLUSIONS. Three-dimensional modeling of the position of the SN in relation
to the musculotendinous architecture of piriformis allows for the evaluation of the feasibility of
compression at this site. Future studies should be directed towards evaluation of these findings
using in vivo imaging of patients with suspected sciatic pain due to piriformis syndrome.

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Intra-ligamentous blood supply of the superior glenohumeral ligament: A histological study.

INTRODUCTION. Although the morphology of the superior glenohumeral ligament (SGHL) has
been examined, the ultrastructure, including blood supply, is less defined. Werner et al. (2000)
found that the SGHL forms a sling for the tendon of the long head of the biceps brachii and
suggested that following supraspinatus tears, rupture of this sling may result in secondary
changes of the biceps brachii tendon due to instability. The purpose of this study was to
investigate the blood supply of the SGHL. METHODS. The ligament was excised from 12 formalin
embalmed cadaveric specimens. Full thickness tissue biopsies were obtained from three sites
along the ligament: medial, middle and lateral. Following fixation with 4% formalin, the tissue was
embedded in parafin and stained with H&E and studied immunohistochemically using the
Avidin-Biotin technique. RESULTS. The vascularization of the SGHL is not homogeneous with the
middle region having the greatest density of blood supply and the lateral region the least. The
vessels of the middle region had the largest diameter when compared to medial and lateral
regions. This pattern of vascularization was consistent in all 12 specimens. CONCLUSIONS.
Variability in the vascularization of the regions of the SGHL may have clinical implications. Since
the sling described by Werner et al. (2000) is formed by the lateral and middle
regions, disruptions in blood supply, especially within the poorly vascularized lateral region, may affect
the functional properties of this sling.

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Variations in sacral nerve root anatomy and their relationship to piriformis: A 3D modeling study.

INTRODUCTION. Intramuscular sacral nerve root compression by the piriformis muscle (PM) has
been hypothesized as a possible cause of sciatica. However, the relationship of the sacral nerve
roots to the PM has not been well documented. The purpose of this ongoing study is to visualize
and quantify the position of the sacral nerve roots as they relate to the PM. METHODS. In five
formalin-embalmed cadaveric specimens, the L4-S3 nerve roots and communicating branches
that form the sciatic nerve (SN) were digitized along with the volume of the PM using a
MicroScribe® G2X Digitizer and were reconstructed in 3D using Autodesk® Maya®. The path of
each sacral nerve root and its communicating branches were defined in relation to the PM and
followed from the anterior sacral foramina to the SN. The presence of intra- and extramuscular
divisions was recorded and characterized. RESULTS. The anterior rami of L4, L5, S1, and S3 were
extramuscular, traveling on the anterior surface of the PM, whereas S2 was intramuscular in three
of five specimens. The S2 in two specimens was covered anteriorly by muscular slips of the PM
and, in one specimen, had a significant intramuscular course, which modified its trajectory. The
angle that was created in S2 was measured using three points: i) the point of emergence from
the anterior sacral foramen ii) the point of emergence from its intramuscular course in the PM
and iii) the point of its contribution to the SN. This marked angle was found to be 154 degrees.

**CONCLUSIONS.** Angulation of S2 at the point it becomes extramuscular may render it susceptible to being stretched by contraction of the PM, possibly causing sciatica. These findings need to be further investigated using in vivo imaging studies in patients with suspected piriformis syndrome.

Saito, Toshiyuki, Hanno Steinke, Takayoshi Miyaki, Shiro Nawa, Kanae Umemoto, Takashi Nakano, and Kem Asamoto. Department of Anatomy, Aichi Medical University, Japan. The structure of the posterior ramus of the lumbar spinal nerve.

**INTRODUCTION.** Knowledge of anatomy is fundamental for the safe and efficacious use of regional anesthesia. Performing a facet joint block is no exception. Understanding the details of the pathway of the posterior ramus of the spinal nerve (PRSN) is necessary to ensure complete facet joint block. In 1982, Bogduk reported that there were three equally sized primary branches of the human lumbar PRSN. The report motivated us to examine the exact pathways of the peripheral portions of the PRSN branches. Therefore, we investigated the detailed anatomy of the human PRSN. METHODS. We studied the layout of PRSN between T10 and L4 segments in seven cadavers by ventral dissection. We used laser scanner to obtain 3D data as well as the classical dissection. A modified Spalteholz's method was also used to produce a transparent specimen of lumbar erector muscles. The data of PRSN by the dissection, laser scanner and the transparent specimens were compiled to produce 3D image using a computer. RESULTS. The major layout of the three branches of PRSN was depicted in three dimensions. The medial branch of PRSN was consistently located between the mammillary process and accessory process under the mammilloaccessory ligament before it entered into the multifidus. The intermediate branch passed between the longissimus and iliocostalis muscles to reach skin. The lateral branch passed through and supplied the iliocostalis before it reached the lateral part of the dorsal skin. CONCLUSIONS. The medial branch supplied the erector spinae proper as well as the intervertebral joints. The radiofrequency neurolysis of the medial branch of the PRSN should be performed at the mammilloaccessory ligament. This is because the nerve is consistently present in the space between the bone and the ligament.

Sakamoto, Yujiro. Tokyo Medical and Dental University. Tokyo 113-8549, Japan. Spatial relations among the muscles at the boundary region between the oral cavity and the pharynx.

**INTRODUCTION.** The walls of the oral cavity and the pharynx contain the muscles that cooperate in the functions. This gross anatomical study investigated the pharyngeal muscles and the buccinator to clarify their spatial relationships at the faucial region. METHODS. After the removal of the mandible and impeditive bones, the muscles were examined under a binocular microscope in 10 Japanese cadavers. RESULTS. The uppermost fibers of the buccinator attached to the tuberosity of the maxilla, and those of the superior constrictor arose from the soft palate between the pterygoid hamulus and the origin of the palatopharyngeus. Their middle fibers attached to the pterygomandibular raphe. The lower fibers of the buccinator and the superior constrictor attached to the mandible anterolateral and posteromedial, respectively, to the insertion of the temporalis. The lowermost fibers of the superior constrictor attached to the arch line. The constrictor ran posteromedially, and the palatopharyngeus passed laterally and posteroinferiorly on the inner surface of the constrictor. After the grade separation, their fibers, which were seriated from circular to longitudinal, attached to the insertion in an arching line. CONCLUSIONS. The contiguous sequence of the fibers suggests that the superior constrictor and the palatopharyngeus make a specially twisted sheet as a functional unit. The
pterygomandibular raphe seems to be an extracapsular ligament of the temporomandibular joint, like the sphenomandibular one, to stabilize the interaction between the superior constrictor and the buccinator during the mandibular movement.

WARD, Peter J. West Virginia School of Osteopathic Medicine. Lewisburg, WV 24901, USA. Fascia superficial to the longissimus thoracis muscle – a pilot study.

INTRODUCTION. In this poster, we describe a sheet of fascia that has not been previously described as a distinct structure. This fascial sheet covers the spinalis and longissimus thoracis muscles and extends laterally from the spinous processes of the vertebrae in a separate plane from the superficial layer of the thoracolumbar fascia. METHODS. 23 cadavers were examined to characterize variations in this fascia and its relationship to nearby muscles and bones. RESULTS. The structure was present in all but one of the specimens. There was considerable variation in the fascia. It was distinct from the latissimus dorsi muscle and aponeurosis. It was most commonly seen as a direct continuation of the serratus posterior inferior muscle, beginning between T9-T11. The fascia continued deep to the serratus posterior inferior muscle but was seen to be continuous with the inferior aspect of the splenius cervicis muscle. It frequently fused with the investing fascia of the iliocostalis thoracis muscle in the region of the costal angle. The fascia had small perforations that allow the passage of posterior neurovascular bundles and it tended to become weaker and less distinct as it continued more superiorly. CONCLUSIONS. This fascia, which has not been previously described as a separate structure, may be biomechanically and clinically important. It’s position may allow it to act as a retinaculum for the longissimus thoracis muscles or allow a potential space affecting the spread of infection or fluid during compartment syndromes.

WEINHAUS, Anthony J., Aaron J. Henderson, and Mark S. COOK. Department of Integrative Biology and Physiology, University of Minnesota, Minneapolis, MN 55455, USA. Technique for improved dissection of the middle ear.

INTRODUCTION. Exposing the structures of the middle ear is a very difficult dissection which often fails to reveal any or all structures. Many curricula and dissection manuals omit this dissection due to infrequency of success. METHODS. A simple protocol has been developed which results in a consistently high rate of success. The goal is to use a large wire-snips to break through the petrous portion of the temporal bone and elevate the tegmen tympani above the middle ear cavity. First, the snips progress towards the internal acoustic meatus (IAM) from medial to lateral in the middle cranial fossa. The posterior of the two jaws of the snips is inserted into the IAM, and the anterior jaws applied to the anterior border of the petrous portion of the temporal bone. The snips are in the same horizontal plane, and millimeters above, the facial nerve. When the snips are adducted, a 2cm thickness of the petrous portion of the temporal bone is separated and elevated above the middle ear cavity. This opening reveals the IAM, Facial nerve, Geniculate Ganglion, Greater Petrosal nerve, and deeper, the ossicles, chorda tympani nerve, and tympanic membrane, etc. RESULTS. This simple procedure routinely results in a productive dissection of the middle ear with high success rates. This is approx 75% of the dissections, compared to approx 25-50% with other previously applied techniques. CONCLUSIONS. This new dissection protocol leads to increased success in the dissection of the middle ear. Students are much more satisfied, in contrast to the frustration students experience with previously used dissection protocols which reveal few, if any, structures of the middle ear.
Abstracts – Poster Presentations Session 2
(listed by presenting author last name)

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Accessory navicular bone; clinically useful during first year anatomy.

INTRODUCTION. The terms sesamoid and accessory bone have distinct definitions, yet they are often used synonymously and not addressed as important clinical structures during anatomy courses. Accessory Navicular(AN) bone is associated with medial foot and ankle pain and flat foot pathologies. The objective of this study was to investigate the use of CT as a paradigm in undiagnosed foot and ankle pain while advocating accurate teaching of sesamoids and accessory bones in anatomy courses. METHODS. Literature search was conducted on contemporary anatomical texts, atlases, websites, and journals regarding the AN. Roentograms and CT scans were performed on 15 embalmed donor cadaver patients (DCP). Each lower limb was palpated followed by deep dissection of the distal tibialis posterior tendon to identify the “osseous structure.” Image and dissection comparisons were conducted. RESULTS. Literature search revealed AN occurs in 5–21% of people. Roentograms revealed the AN in 5/23 DCP’s. CT scans revealed the AN in 13/28 feet. Deep dissection revealed the AN in 10/28. DISCUSSION. Despite the prevalence of AN in the literature, it is not accurately addressed in anatomy courses. It is a known cause of medial foot and ankle pain and radiologically associated with false negatives. Literature revealed that MRI is the predominant imaging medium used to identify AN. CT scans are a cost effective approach and could be used as part of a radiology paradigm when investigating unknown foot and ankle pain. CONCLUSION. This study suggests that anatomy courses include accessory bones, specifically the AN, as clinically relevant structures while teaching the foot and ankle region. CT scans could follow roentograms as part of a diagnostic paradigm when treating unknown foot and ankle pain.

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Novel femoral artery terminology: Integrating anatomy and clinical procedures leading to standardized intuitive nomenclature.

INTRODUCTION. The femoral artery (FA) in its general glory is often defined as the continuation of the external iliac artery. Specifically, when the external iliac artery reaches directly beneath the inguinal ligament it becomes the FA. The FA is the dominant artery feeding the lower limb. Currently, terminological anatomica (TA) defines the profunda femoris as its terminal branch. Clinicians (radiologists and surgeons) often use superficial femoral artery (SFA) rather than FA and profunda or deep femoral artery. The SFA is actually very deep and well protected for most of its journey. On observation the terminology is not intuitive. The objective of this study was to investigate the terminology associated with the morphology and clinical uses of the FA and its terminal branches suggesting an ideal terminology that addresses both morphology and function. METHODS. Literature search was conducted regarding the nomenclature of the FA and its terminal branches. Dissection of 89 embalmed cadavers (49F, 40M, ages 47–89) was conducted to analyze the morphology of the FA and its branches. RESULTS. Literature revealed a difference in terminology between both anatomy and clinical (texts/atlases/journals) regarding
the FA and its terminal branch. Dissection revealed FA morphology specific to anterior and posterior compartments of the thigh. DISCUSSION. A difference in terminology exists between the anatomy and clinical arenas. A need for a standardized terminology is necessary since clinicians and their publishers have not adopted TA. CONCLUSION. This study suggests the current FA be considered the common femoral artery (CFA). Of the branches, the continuation of the FA or SFA becomes the anterior (AFA) and current profunda or deep becomes the posterior (PFA) femoral arteries.

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Piriformis syndrome: Implications of anatomical variations, diagnostic techniques, and treatment options.

INTRODUCTION. Piriformis syndrome continues to have a certain degree of controversy with regards to the proper diagnosis and most effective form of treatment. While the cause, diagnosis, and treatment of piriformis syndrome remain elusive, many studies have been conducted to investigate newly developed diagnostic techniques, as well as various treatment options for piriformis-induced sciatica. METHODS. Despite the quantity of literature on this topic, few studies have demonstrated statistically significant results that support one form of treatment over another. In this study we will present a meta-analysis of piriformis syndrome, sciatica and other conditions associated with low back pain. RESULTS. The term “piriformis syndrome” was first used by Robinson in 1947 when he described the syndrome as having six key characteristics: (1) a history of trauma or direct fall to the buttock; (2) gluteal or sacroiliac pain radiating down the leg; (3) gluteal atrophy; (4) a palpable sausage-shaped mass; (5) positive Lasegue sign; and (6) exacerbation with bending or lifting. Another surgeon Freiberg developed a more succinct set of criteria for defining piriformis-induced sciatica. Freiberg’s 3 indications for piriformis-induced sciatica included: (1) tenderness at the sciatic notch, (2) positive Lasegue (straight leg raise) sign, and (3) improvement with nonsurgical treatment. Despite their attempts to accurately identify the characteristics that exclusively define piriformis syndrome, there are apparent problems with both Robinson’s and Freiberg’s definitions. CONCLUSIONS. It is apparent that there are still issues of uncertainty and controversy relating to the proper diagnosis and most effective form of treatment for piriformis syndrome.

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Intramuscular compartmentalization of the subscapularis based on neuromuscular innervation patterns.

INTRODUCTION. Subscapularis is a functionally important component of the rotator cuff. The infraclavicular nerves including the subscapular nerves are at risk of injury following open shoulder repair resulting in denervation of the muscle. Much variability has been found in the extramuscular innervation pattern, whereas the intramuscular innervation has not been well documented. This study aims to investigate extra- and intramuscular innervation patterns of subscapularis using dissection and 3D modelling. METHODS. All branches entering the muscle belly were identified and digitized in seven formalin-embalmed cadaveric specimens. Each intramuscular branch was digitized throughout the muscle volume and reconstructed into a 3D model using Maya®. The model was used to determine neuromuscular partitioning patterns within subscapularis. An additional 23 specimens were then dissected to study extramuscular variations. RESULTS. The subscapularis was neuromuscularly partitioned into two to four compartments. Two specimens were found to have two compartments, superior and inferior, splitting the muscle belly in half, whereas four specimens had three compartments, superior,
middle and inferior, dividing the muscle into thirds. One specimen was partitioned into thirds with the inferior compartment further subdivided into inferomedial and inferolateral. CONCLUSIONS. Subscapularis is partitioned into two to four parts, based on intramuscular innervation patterns. The proportion of muscle volume denervated by extramuscular nerve lesions may be directly related to intramuscular compartmentalization, which varies by innervation pattern.

DELCASTILLO, Estevan, Allysha PRIOR, Timothy ROACH, Michael SNOSEK, Rachel GEORGÉ, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies. An endoscopic and ultrasound approach to the valves of the femoral veins.

INTRODUCTION. Chronic venous insufficiency is defined as an abnormally functioning venous system caused by venous valvular incompetence, with or without venous outflow obstruction. The deep, superficial, and perforating venous networks of the lower limb can also be affected by this valvular dysfunction. Surgical repair of the proximal valve of the femoral vein has been shown to improve complications of chronic venous insufficiency. The aim of this study was to describe the anatomy of the valves of the femoral vein with the use of ultrasound and surgical endoscope. METHODS. We examined 50 adult healthy individuals with the aid of Logiq E ultrasound unit using a 12Hz transducer. In addition we examined 50 cadavers with the aid of a 5mm 0 degrees flexible and rigid Stryker endoscope. RESULTS. The number of valves of the femoral vein had a range of 1 to 4. The mean number of valves was 2. Several morphometric parameters were calculated and will be presented. CONCLUSIONS. Endoscopy and ultrasound examination of the valves of the femoral may prove useful in the diagnosis and treatment of vein external therapy, phlebography, duplex scanning, and scoring reflux patterns.

FOLGER, Walter H., Nancy WILSON-MARTINO, Anne GREGOIRE, and Shea BEARD. Albany Medical College, Albany, NY 12208, USA. Locating the tip of the endotracheal tube in the trachea.

INTRODUCTION. The capnograph has eliminated catastrophic esophageal tube intubation. Auscultating respiratory sounds bilaterally after intubation identifies endobronchial intubation. Neither identify endobronchial intubation with position changes. The carina is difficult to identify compared to the endotracheal tube (ETT) tip by chest radiograph. METHODS. On two fresh cadavers, the ETT has been placed through the glottic opening with direct laryngoscopy. The ETT was withdrawn until the top of the cuff was seen at the vocal cords and inserted two more centimeters. The tracheal distance from the bottom of the anterior cricoid cartilage to the suprasternal notch and from the suprasternal notch to the fourth rib were measured. The length of the ETT in the trachea was 8.5 cm. The distance from the cricoid cartilage to the suprasternal notch was 4 cm for male and 1.5 cm for female. The distance from the suprasternal notch to the fourth rib was 12.5 cm for male and 10.5 cm for female. The length of the trachea was 16.5 for male and 12 cm for female. The distance of the tip of the ETT to the carina was 5 cm for male and 3.5 cm for female. CONCLUSIONS. The depth that the ETT is placed below the vocal cords can be measured. The position of the tracheal carina can be estimated by the fourth rib. The difference between the depth of ETT placement and tracheal length can be calculated to prevent endobronchial intubation.

FOLTERMAN, Chris, Anna ŻURADA, Denzil ETIENNE, Jerzy GIELECKI, Maciej MICHALAK, Ewa KUCHARCZYK, R. Shane TUBBS, and Marios LOUKAS. St. George's University, St. George's, Grenada, West Indies. Transverse pericardial sinus: Normal or pathologic? An anatomical CT approach.
INTRODUCTION. The transverse pericardial sinus is a uniquely located structure. Despite the many descriptions provided in the literature, discrepancies still exist regarding its nomenclature and subdivisions. Interestingly, as noninvasive diagnostic techniques, such as computed tomography (CT) and magnetic resonance (MR) imaging, have improved pericardial visualization, there has been a paradoxical increase in the misinterpretation of the transverse pericardial sinus and its constituent recesses. METHODS. In this meta-analysis, we will explore the normal anatomy of the transverse pericardial sinus and associated recesses while highlighting some of the different pathologies that may involve this structure. Emphasis is placed on the normal and pathological appearance of this structure with CT imaging. In addition, inconsistencies surrounding the presence of the right lateral superior aortic recess are also addressed. Finally, the clinical and surgical significance of the transverse pericardial sinus is described. CONCLUSIONS. Improvements in CT have directly increased visualization of the transverse pericardial sinus and constituent recesses. An understanding of the anatomy and normal appearance on the CT is therefore essential to prevent misdiagnosis.


Anatomy of the transplanted heart.

INTRODUCTION and METHODS. Since the first successful heart transplantation in 1967 by Christian Barnard this surgery became a therapeutical option in terminal heart failure with the number of these interventions being progressively higher in all over the world. The surgical mortality rate of this intervention is now inferior to 10%, in the early post operative period mainly due to surgical complications, in the late post-operative period mainly due to infection, rejection and coronary artery disease. On that basis a reference to the anatomical-clinical characteristics of the transplanted heart is made. RESULTS and CONCLUSIONS. Macro and micro anatomy of the transplanted heart is presented and compared to the usual normal heart anatomy by means of photos and archive images with some explanation notes about the underlying adaptative processes.

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Surgical anatomy of the cardiac lymphatic system.

INTRODUCTION. Many papers have been published concerning prevention of arrhythmias and coronary events after cardiac interventions but few information exists about lesions caused in the cardiac lymphatic system as possible contributions to them. METHODS. Based on a literature review subjects concerning clinical and surgical anatomy of the cardiac lymphatic system are presented. RESULTS. In the anatomical literature the lymphatic system of the heart includes the three lymphatic plexus (subendocardial, myocardial, epicardial) and the main lymphatic collectors, those are described to drain into mediastinal lymph nodes and the thoracic duct back into the systemic circulation. One of main roles of the cardiac lymphatics seems to be the protection of the interstitial space against tissue swelling, this function is compromised if cardiac lymphatic drainage is reduced or disrupted conducing to lymphostasis. Cardiac lymphostasis has been associated with arrhythmias and characteristic electrocardiographic appearance mimetizing coronary ischemia caused by extrinsic compression and unobstructed coronary flow. The main lymphatic trunks can anatomically be damaged during interventions concerning mainly the aortic and pulmonary roots. Regeneration of lymphatic vessels and re-establishment of lymphatic integrity takes 2-20 weeks, in the mean time myocardium may show signs of irreversible damage. CONCLUSIONS. During aortic and pulmonary root interventions preservation of the main lymphatic trunks may help to prevent some of the complications.
associated to the perioperative period and lymphatic drainage of the heart may seem to have an important clinical role on that context, in heart anatomy.

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Neuromuscular partitioning of supraspinatus: an anatomical study.

INTRODUCTION. The inter-relationship between muscle architecture of supraspinatus (SP) and its intramuscular innervation pattern has not been well documented. The purpose of this study is to determine the relationship between fibre-bundle (FB) architecture and intramuscular innervation of SP. METHODS. The suprascapular nerve (SSN) was digitized throughout the muscle volume in five formalin embalmed specimens and the data modeled using Autodesk® Maya® 2011. The 3D models were used to relate the intramuscular innervation pattern to Kim et al.’s (2007) muscle and tendon architecture findings. RESULTS. Kim et al. (2007) found the SP to consist of anterior (87% of volume) and posterior (13%) regions, with each region being further subdivided into superficial, middle, and deep parts. All parts of the anterior region of SP were found to be innervated by a single branch, whereas all parts of the posterior region had dual innervation. The anterior branch innervates the superficial and deep parts of the anterior region whereas the medial branch innervates the middle part. The superficial, middle, and deep parts of the posterior region are innervated laterally by the lateral branch and medially by the deep branch. CONCLUSIONS. The innervation of the posterior region is unique in that the medial three-quarters of the FBs are supplied by the deep branch of SSN and the lateral one-third of the same FBs by the lateral branch. This innervation pattern may play a role in the in vivo findings of Kim et al. (2012) who reported that mean FB length of the posterior region, but not the anterior region, was significantly shorter in cuff tear groups than normal. The findings support the need to reassess excises protocols for SP, which are not yet based on neuromuscular partitions.

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Age-related decrease in PRG4 and elastin expression in rat tendons.

INTRODUCTION. The muscular-skeletal system (muscle-tendon-bone) is well known to undergo age-related changes. Age-related modifications in tendons are much less studied than those in skeletal muscle and bone, but increased stiffness and decreased collagen turnover have been previously reported. METHODS. We compared Achilles and tibialis anterior tendons from 3-5 month old and 22-25 month old rats using quantitative PCR (QRT-PCR) and immunostaining in order to identify factors that could affect the increased stiffness of tendons from the old rats. RESULTS. QRT-PCR showed that Achilles tendons of old compared with young rats had significantly decreased mRNA expression levels of proteoglycan 4 (PRG4) and elastin (Eln). There was no statistically significant difference in the mRNA expression of connective tissue growth factor (CTGF), TGF-beta 1 and stromal cell derived factor 1 (SDF1) between tendons from young and old rats. Immunofluorescent staining of tibialis anterior tendons showed good correlation with QRT-PCR results with the exception of SDF1 expression. Immunofluorescence showed decreased expression of SDF1 protein in tendons of old rats but QRT-PCR showed only a trend to the decreased SDF1 mRNA expression that did not reach statistical significance. PRG4 protein was localized to the cell bodies of tenocytes as well as to the fascicular sheets and epitenon. The current study is the first to show that PRG4 and Eln mRNA and protein expression is decreased in tendons of old rats. CONCLUSIONS. Our data show that decreased PRG4 and Eln expression in tendons could have an effect on the increased tendon stiffness and might be
associated with decreased muscular-skeletal system mechanical activity in elderly. Support: NIH Grant AR-055624 (SB) and IUSM-Northwest (TK).

Anatomy of the facial nerve branch to corrugators supercilii muscle.

INTRODUCTION. Hyperactivity of the corrugator supercilii is responsible for the glabellar furrows, which can be reduced by selective neurotomy. The aim of this study is understanding of the detailed anatomy of the innervations of the corrugator supercilii. METHODS. We dissected 27 hemi-faces of 17 Korean cadavers utilizing an operating microscope. Sihler's nerve stain was performed on the bilateral corrugators supercilii, orbicularis oculi and procerus muscles from 7 Korean cadavers to investigate the intramuscular course and the anastomosis of the nerves. RESULTS. The corrugator supercilii received one (29.3%) or two rami (70.7%) that originated from the temporal branch of the facial nerve. These rami were located at the mean 22.5 mm superior to the intersection between the lateral border of the orbital rim and the extension line of the lateral canthus. The average vertical distance between the lateral canthus and the rami was 24.3 mm. The rami ran 11.2 mm above the lateral margin of the supraorbital border and 8.3 mm above the middle of the supraorbital border. The rami inserted into the corrugator at 7.1 mm above the supraorbital border. Also, we observed that most of the rami passed within the eyebrow area above the lateral canthus. The sensory branches from supraorbital nerve running in the corrugators muscle were also visible. CONCLUSION. These results will aid in reducing complications in selective neurotomy and to achieve effective elimination of the glabella furrows. (This research was supported by Basic Science Research Program through the National Research Foundation of Korea(NRF) funded by the Ministry of Education, Science and Technology (7-2010-0559).)

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Students' experience and expectations for e-learning: online histology course design.

INTRODUCTION. Despite marked increase in online courses and programs in the digital age, completely online histology courses are scarce due to its visual nature that requires laboratory and quality instructor-student interaction necessary to acquire pattern recognition skills. In this study, an online histology course design that adheres to the Quality Matters guideline and utilizes currently available technologies is explored. METHODS. A qualitative study was conducted using semi-structured interviews and a focus group of first year dental students who have taken a traditional histology course. The study aimed to obtain students' learning experience with current online course management system, educational website and/or interface, and their expectation of a functional web-based educational environment. A focus group was conducted to improve data collection and achieve consensus. The audio-taped interviews and focus group were transcribed verbatim and analyzed thematically to discover meaningful phenomenon that represent students' perspectives. Based upon the results of this analysis, a set of themes of students' experience and expectation of an online histology course was generated. RESULTS. Data analysis reveals that students expect in an online histology course: 1) a visual assistance with interactive features; 2) low-risk and continuous self-assessment opportunities; 3) multimedia support for a variety of mobile and stationary interface; 4) ample and easy interaction with peers and instructors. CONCLUSIONS. The study revealed students' demand and readiness for an online histology course and their expectations in the e-learning experience. Detailed data and an online histology course design that meets student expectations and QM guidelines will be presented.
INTRODUCTION. Students of the Millennial generation bring a unique set of technological skills, experiences, and expectations to the anatomy classroom and lab. On a daily basis, they rely upon Web 2.0 tools for news updates and social networking and yet, anatomy educators have not explored the potential of these tools for pedagogically engaging their Millennial students. Twitter is a Web 2.0 microblog where users post messages (“tweets”) of 140 characters or less that are read by other users who have chosen to “follow” the person who posted the tweet. The present study describes the use of anatomy tweets as a supplemental instructional tool in two health professional gross anatomy courses. METHODS. One hundred and twenty six dental and allied health students at the University of Kentucky signed up to receive tweets on the thorax and abdomen in the Spring 2012 semester. Most students (75%) received tweets on smart phones or ipads. A total of 70 anatomy tweets were sent over a period of 3 weeks. Three types of tweets were distributed: dissection and identification tips, high yield facts and questions. Dissection tweets were sent 1-2 hours prior to lab, focusing on tips for identifying structures for that day. High yield anatomy facts and questions were sent on a daily basis. While 34% of students found the frequency and timing of the tweets to be optimal, 56% indicated that dissection tweets should be sent the day before the lab session. Eighty five percent reported that the tweets were educationally beneficial, with a preference for the question tweets. CONCLUSIONS. Using Twitter to bring anatomy to students’ mobile devices may be an effective way to keep anatomy content on their minds and to encourage sound study habits using Web 2.0 technology.

INTRODUCTION. Injury to the recurrent laryngeal nerve (RLN) is one of the most common iatrogenic complications of thyroid surgery. The anatomical course of the nerve also increases its susceptibility to injury and many variations have been documented in the literature. The aim of this study was to identify the course of the RLN and its relationships to key surgical landmarks with the aid of non invasive techniques such as an ultrasound. METHODS. We examined 50 adult healthy individuals with the aid of Logiq E ultrasound unit using a 12Hz linear transducer. In addition, we examined 20 cadaveric necks with the aid of ultrasound and then we dissected these cadavers to identify the RLN. RESULTS. We were able to identify the RLN as a linear hypoechoic structure in the tracheoesophageal in 10 healthy individuals examined. Similarly, the RLN was found in 6 cadaveric necks. Despite the fact that the RLN is not clearly visible in all patients or specimens, the ultrasonography can expose very clearly the plane between the thyroid gland and the cervical part of the esophagus, where the RLN is located. CONCLUSIONS. On the basis of this study, a new, noninvasive, method to locate the RLN at the space between the thyroid and cervical esophagus is introduced. This may lead to further clinical application such as presurgical localization of RLN or ultrasound-guided needle procedures.
INTRODUCTION. Human anatomy laboratory remains to be one of the most challenging courses in medical school. Students are required to perform high quality dissections, even though most of them do not have previous experience and struggle with learning by merely reading a lab manual. METHODS. To make this task less daunting we produced a series of anatomy dissection videos to visually and audibly teach students the landmarks to focus on and how to dissect. Videos are approximately ten minutes in duration and illustrate dissection techniques and important anatomical relationships. RESULTS. Student feedback of the videos was overwhelmingly positive with 68% increased satisfaction from a group of students utilizing the dissection videos versus a control group. Student comments include “I have greater confidence and understanding of the dissections” and “I couldn’t understand what they described in the book, but the video helped it all make sense.” Furthermore, dissection quality of the students viewing the videos was significantly better than the control group (p<0.01). CONCLUSIONS. We discuss the process of producing the videos and advocate the use of dissection videos to help guide students in human anatomy dissection.

INTRODUCTION. The larynx is an important part of the respiratory system and has great clinical relevance. While many medical procedures involve manipulation or accessing different areas of the larynx, few studies quantify the distances within and between these cartilaginous structures. METHODS. Our study investigated the size and distance of the hyoid bone, thyroid cartilage and cricoid cartilage and the distances between these structures on human cadavers (n=37). RESULTS. Surprisingly, a significant difference in the size of the cartilaginous structures was not identified in most parameters between genders (p=0.318). However, the distances of the fibrous gaps that lie between the hyoid bone the cartilaginous structures were higher in females than males (p<0.05). CONCLUSIONS. Knowledge of this variability has a significant impact on clinical processes like tracheostomies and cricothyrotomies of different genders.

INTRODUCTION. Helping students to visualize the origin, insertion, position and relationships of muscles is a challenge. We present a visual, interactive exercise to reinforce student understanding in this area. METHODS. Students were asked to place precut two-dimensional felt models of the muscles on a life sized skeleton or disarticulated bones matching the correct bony origins and insertions. In order to assess the impact of this approach on student learning, the students were split into two groups. The first group spent 15 minutes utilizing the felt leg muscles while the second group spent 15 minutes reading their books to study the muscular attachments of the leg muscles. A pre-test and a post-test covering the material were administered to both groups. RESULTS. Students who worked with the felt muscles showed a greater improvement relative to the students who studied independently (p<0.05). The groups switched activities when studying the foot muscles and similar results were found. Student satisfaction was assessed with a
survey administered after each unit. The majority of students indicated that the activity was fun and felt that the activity was an effective way to learn the material. CONCLUSIONS. We advocate the use of this type of activity to engage the students and to provide an opportunity for the students to reinforce their understanding of muscular attachments.

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Integrated longitudinal cases in medical curriculum: An example case of hepatocellular carcinoma.

INTRODUCTION. Presentation of integrated clinical cases provides context and motivation for students to learn basic science material. Pathological features of common diseases allow students to learn by contrast of normal with abnormal. METHODS. Presented here is one such integrated longitudinal case involving a patient with vertically transmitted chronic hepatitis B complicated by the development of multifocal hepatocellular carcinoma, from initial diagnosis by imaging and on biopsy through segmentectomy, to development of metastasis followed by systemic therapy, transarterial chemoembolization (TACE) and post-therapeutic complications of hand-foot syndrome (Palmar-Plantar Erythrodysesthesia). The case is presented over the first three years of medical school. Materials include de-identified case history, radiographic imaging, histopathological slides, gross photographs and plastinated specimens. RESULTS. Components presented during year 1 include initial abdominal imaging, liver biopsy and segmentectomy. Components presented during year 2 include findings of recurrent and metastatic disease and development of hand-foot syndrome. Components presented during year 3 include issues of chronic and terminal disease, including long term monitoring and management of hepatitis B, activities of daily living (ADLs) and instrumental activities of daily living (IADLs), psychological counseling and hospice care. CONCLUSIONS. Integrated longitudinal clinical cases can be touchstones for providing continuity and building of depth and breadth within medical training.

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An ultrasonographic identification of the variations of the internal jugular vein.

INTRODUCTION. The internal jugular vein (IJV) is one of the most commonly used veins used for central venous access. However IJV cannulation may result in complications such as accidental carotid arterial puncture, irritation to the brachial plexus, pericardial tamponade, haemothorax, pneumothorax and formation of a local haematoma in the presence of anatomical variations. The aim this study was to explore the relationship of IJV with the common carotid artery. METHODS. We examined 50 adult healthy individuals with the aid of Logiq E ultrasound unit using a 12Hz linear transducer. RESULTS. The mean diameter of the IJV was 10.8mm and its distance from the common carotid 1.9mm. We are able to classify the position of the IJV in relationship with the common carotid artery into 3 types. Type I, the IJV was located laterally to the common carotid artery, Type II, the IJV was located anterior to the common carotid artery and Type III, the IJV was located medially to the common carotid. CONCLUSIONS. Ultrasonographic examination of the IJV anatomy it is an important diagnostic tool in order to avoid iatrogenic complications.
INTRODUCTION. Strengthening exercise for the infraspinatus (IS) muscle is commonly prescribed for rotator cuff, shoulder pathology. Our present knowledge of IS muscle fiber bundle architecture and innervation suggests three distinct regions. Given the potential for regionally specific activation of IS, rehabilitation of this muscle may be most effective when functional distinct regions are targeted by physical therapy. The purpose of this study was to systematically review the current literature of IS strengthening and exercise prescription and determine if health care practitioners purposefully target functionally distinct regions of IS. METHODS. A thorough review of the literature was performed to compile available data pertaining to IS strengthening and rehabilitation. Medline, PubMed, CINAHL, Embase, Scholar’s Portal and Google Scholar databases were searched to January 2012. RESULTS. A broad range of rehabilitation practices were described that target the IS muscle. The battery of exercises identified in the literature primarily treated the IS muscle as a single structural unit. Interestingly, Otis et al. (1994) and Camilla et al. (2009) provide biomechanical evidence that specific exercise can isolate the distinct, structural regions of IS. In addition, Decker et al. (2003) have reported upper and lower partitions of the subscapularis muscle can be differentially recruited with physical therapy. CONCLUSIONS. Our review of the literature reveals a sparsity of research supporting the strengthening of structurally distinct regions of IS. More studies are needed to assess the effectiveness of IS strengthening and the ability of health practitioners to treat distinct regions of IS.
the aid of ultrasound. METHODS. We examined 50 adult healthy individuals with the aid of Logiq E ultrasound unit using a 12Hz linear transducer. In addition, we examined 30 cadaveric elbows with the aid of ultrasound and then we dissected these cadavers to identify the PIN. RESULTS. The PIN was identified in all healthy individuals and cadavers. The PIN became flattened as it pierced the proximal supinator muscle in the forearm in all healthy individuals. CONCLUSIONS. Sonographic evaluation for entrapment neuropathies is becoming an important diagnostic tool, however, there still many answered questions. The flattened appearance of the PIN should not be misinterpreted as nerve entrapment and avoid unnecessary surgical procedures.
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Bulbospongiosus muscles and the perineal body in females.

INTRODUCTION. The perineal muscles have been thought to connect to the perineal body in both sexes for a long time. However, it would be very difficult to recognize the perineal body during dissection practices especially in females. We investigated the positional relationships between the perineal body and the perineal muscles. METHODS. In this study, we used 20 pelvic halves of 10 Japanese female cadavers (Mean age 82.3 y/o). All specimens were fixed in 8% formalin and were preserved by 50% ethanol. After division in the median line, we dissected right halves from the medial aspect macroscopically. In addition, we examined histologically the region around the anterior wall of the external anal sphincter of left halves. RESULTS. It was very difficult to recognize the tendinous structure at the anterior margin of the anus. The connective tissues on the anterior wall of the external anal sphincter were identified as the smooth muscle, which complied was the continuous fibers of the longitudinal muscle of the rectum, according to the immunohistological stains by the anti-smooth muscle antibody. These fibers were expanded to the subcutaneous tissues of the vestibule of the vagina. In addition, the bulbospongiosus muscle did not reach to the midline of the anal region, and was adjoined with the lateral surface of the external anal sphincter muscle. CONCLUSIONS. The perineal body in females complied the mass of the smooth mucles fibers continued from the longitudinal muscles of the rectum, or was that of the muscle fibers of a part of the longitudinal muscles of the rectum. In addition, this body was not the pivot of the perineal muscles in females.

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Prostate anatomy: analysis of controversies between anatomists and clinicians leading to improved structural recognition and terminology clarity.

INTRODUCTION. In 1983 Walsh and Donker improved radical prostatectomy outcomes with a neurovascular sparing technique developed during anatomy dissections. Despite the link between anatomical preservation and clinically proven outcomes, controversies have existed the past four decades regarding periprostatic (PP) terminology and detailed structural recognition. The objective of this study was to analyze and investigate PP structures and provide a more accurate terminology. METHODS. Literature search of contemporary anatomy and specialty texts, atlases, websites, and journals, was conducted regarding prostate and PP anatomy. All terminology was cross-referenced with terminologia anatomica. Dissection of the prostate region from 21 embalmed male cadavers was conducted. RESULTS. Literature search revealed several obvious terminology differences and lack of detailed structural identification regarding PP nerves, arteries, veins and fascia between anatomists and clinicians. Dissection revealed PP structures. DISCUSSION. Prostate examination is conducted on every adult male and surgery is now a common safe effective treatment for varied pathologies. Detailed anatomy and accurate terminology is essential to understand this clinically important area. Analysis from this study recommends deleting, altering and adding to the current PP terminology. CONCLUSIONS. This study recommends PP neurovascular morphology and fascia be named to
accurately reflect the structural orientation and function of the PP region which would better serve anatomists and clinicians.

BEST, Irwin M. Emory University Hospital, Atlanta, GA 30322, USA. Naturally occurring splenorenal shunt.

INTRODUCTION. With advanced liver disease multiple shunts develop between the portal and systemic circulation to return mesenteric venous blood to the heart. While several of these shunts result in bleeding and other complications, the most beneficial and perhaps the most innocuous is the splenorenal shunt that develops between the splenic collaterals and the left renal vein. Such a surprisingly large shunt was discovered during the placement of a transjugular intrahepatic portosystemic shunt (TIPS). METHODS. A 68 year old lady with advanced cirrhosis and refractory ascites presented for a TIPS shunt to control her unmanageable ascites. She was on maximum medical therapy and weekly large volume paracentesis. A diagnostic catheter was guided through the liver and into the portal vein. Injection of contrast revealed a large caudad that communicated with a larger horizontal vein which emptied into the vena cava. Fearing procedural misadventure, the venogram was repeated to clarify the venous anatomy. The vein was readily identified as a naturally occurring splenorenal shunt with high volume flow into the Inferior vena cava. RESULTS. The TIPS shunt was completed with a drop in the portal to systemic gradient less than 8 mmHg. CONCLUSIONS. As portal venous pressure increases shunting occur between the portal and systemic circulation. This naturally occurring splenorenal shunt might be the most physiologic in that it routes mesenteric venous blood to the larger renal vein with high flow.

BOAZ, Noel T., Richard SIKON, and Dana SIKON. 1Integrative Centers for Science and Medicine, Martinsville, VA 24112, USA; and Virginia Commonwealth University, Richmond, VA 23284, USA; 2Virginia State Anatomical Program, Office of the Chief Medical Examiner, Richmond, VA 23219, USA. Comparison of soft-embalming, low/non-formaldehyde procedures for laboratory instruction in Anatomy.

INTRODUCTION. "Soft-embalming" techniques that offer natural color, flexibility of structures, and low levels of formaldehyde exposure present significant didactic advantages for dissection-based laboratory instruction in Gross Anatomy. We compared two leading procedures that confer preservation lasting at least one semester in order to improve the quality of cadavers for anatomic dissection. METHODS. Human cadavers were embalmed using the Thiel Method (Thiel 1992, 2002) and a similar method utilizing a non-formaldehyde-based preservative developed by an embalming fluid company. Criteria used for comparing the two procedures include technical difficulty, preservation quality, antimicrobial properties, color, flexibility, and cost. RESULTS. Both procedures yielded good to excellent preservation of structures combined with no odor of formaldehyde and much improved tissue flexibility and natural color. Neither method presented significant technical difficulties for experienced embalmers. Embalming chemicals are readily available in the U.S. and were marginally more expensive than traditional embalming, depending on volume ordered. The Thiel Method was more time-consuming but showed longer-lasting preservation. The non-formaldehyde-based preservative method was technically simpler and offered ease of preparation. CONCLUSIONS. The two methods of low/non-formaldehyde soft-embalming evaluated offer significant didactic advantages in Gross Anatomy instruction and are technically feasible, economical, and worthy of further evaluation by instructors of dissection-based Gross Anatomy courses.
INTRODUCTION. Recently there has been a renewed interest in harvesting the Radial artery for use in a number of clinical graphing procedures due to its apparent advantages over traditional saphenous vein and internal thoracic arterial graphs. Anatomically the hand receives a dual blood supply which communicates via an anastomosis: the superficial and deep palmar arterial arches. Some individuals lack this communication and are therefore at risk of developing ischemia post radial artery harvest. This study assessed the amount of variability in the pattern of the superficial palmar arch in a South African sample. METHODS. The left forearm and hand of South African adult white cadavers were used in this study (N=35). Careful blunt dissection of the palmar area of the hand was conducted. RESULTS. Variations of the superficial palmar arch were substantial, with a total of 20 types being identified. The criteria used to classify a complete or incomplete arch varies among authors. If morphological criteria are applied this study showed only 38.8% (N=14) however when considered in terms of perfusion the incidence increases to 93.5% (N=33). It was noted that a persistent median artery was present and contributed to the completion of the arch in 8 individuals. CONCLUSIONS. The findings are comparable to that in other studies however the incidence of complete superficial arch is higher than in studies done previously in South Africa. The data indicates that radial artery harvest for clinical procedures is a possibility in the majority of individuals.

INTRODUCTION. Formaldehyde is a known carcinogenic agent that is routinely used in the preservation of bodies for use in anatomical dissection courses. There are various methods to minimize exposure of students and faculty to the carcinogenic fumes, primarily focusing on ventilation designs. Ventilation may remove some or most of the noxious fumes, but does nothing to remove direct exposure via the skin contact and absorption. Therefore, various post-embalming treatments have been developed to reduce or eliminate formaldehyde within embalmed tissue. METHODS. One such chemical treatment, monoethanolamine, was developed and tested through a collaborative effort between a chemical supplier and the University of Michigan Anatomical Donations Program (W.E. Burkel, D.A. Mueller, J. Follo, and L. Wessels: Formaldehyde neutralization in embalmed cadavers using monoethanolamine. Clinical Anatomy 12 (6): 34 (1999)). The monoethanolamine treatment is basically a final perfusion of the body, approximately 72 hours after embalming with standard formalin solution, with a solution (20-1 by volume) of monoethanolamine. RESULTS. This treatment denatures the formaldehyde and renders it harmless. It also does not result in any residue on the tissues, as certain postfixation agents are known to do. With such an easy and relatively inexpensive solution to carcinogenic exposure, one would expect that many schools would adopt this method. CONCLUSIONS. Our telephone survey of donations programs across the U.S. showed, however, that formaldehyde neutralization of any type is extremely rare. The results of our survey raise the issue of the ethics of exposing students and faculty to a known carcinogenic agent when neutralization is an easy and inexpensive alternative.
Implementing a Convocation of Thanks to honor donors and increase awareness of the UVM Anatomical Gift Program.

INTRODUCTION. The University of Vermont (UVM) Anatomical Gift Program (AGP) has undergone substantial reorganization in the past year. In 2011, the AGP was restructured based on criteria set forth by the American Association of Clinical Anatomists (AACA) and American Association of Anatomists (AAA). This reorganization has resulted in several changes within the Program. One major change has been increasing awareness of our program through developing a formal “Convocation of Thanks” (COT) to recognize our donors. METHODS. In 2011, a structured Student Planning Committee (SPC) was formed with oversight by a faculty supervisor. For the first time, all donors’ next-of-kin were invited to attend the COT, and to share about the donors through writing or speaking at the event. The SPC chose to give gifts of wind chimes to donor families, and fundraise to plant a Memorial Tree to honor donors. RESULTS. Attendance to the event exceeded expectations. Four family members accepted the invitation to speak at the event, and there was a large response to requests for writing about donors, which were displayed at the reception. Feedback from students, faculty, and families was positive, with several family members suggesting that it helped them to understand how important whole body donation is to medical education. CONCLUSIONS. The changes to the COT have positively impacted the interaction between the UVM AGP and surrounding communities. The act of recognizing our donors has been successful in raising awareness about our program, by bringing together students, faculty, and donor families. The AGP will continue to implement new methods for developing awareness about our program in the future.

The topographic anatomy of the right and left inferior phrenic arteries.

INTRODUCTION. Transcatheter arterial chemoembolization is a common treatment for patients with nonoperable hepatocellular carcinoma. If the carcinoma is advanced or the main arterial supply, the hepatic artery, is occluded; extrahepatic collateral arteries may develop. Inferior phrenic arteries (IPA) are the most frequent and important among these collaterals. Yet, the topographic anatomy of these arteries have not been described in detail in most anatomy textbooks, atlases and previous reports. METHODS. 26 embalmed cadavers were dissected bilaterally in order to investigate their origin, course and distribution. RESULTS. The IPA’s originated as a common trunk in 5 cadavers. The right IPA originated from abdominal aorta in 13 sides (% 25), renal artery in 2 sides (% 3.8), coeliac trunk in 1 side (% 1.9) and left gastric artery in 1 side (% 1.9). The left IPA originated from abdominal aorta in 9 sides (% 17.4) and coeliac trunk in 6 sides (% 11.5). In 6 cadavers, regarding 4 right and 6 left sides, the ascending and posterior branches of the left IPA had different source of origins. The ascending, posterior, superior suprarenal, middle suprarenal, inferior vena caval, oesophageal and gastric branches of the IPA were observed. CONCLUSIONS. As both IPA’s represent the half of all extrahepatic arterial collaterals to hepatocellular carcinomas, their anatomy gains importance not only for anatomists but surgeons and interventional radiologists as well.
INTRODUCTION. The pudendal nerve (S2-S4), which is a branch of the sacral plexus, is a motor and sensory nerve of the perineum. While performing procedures like nerve anastomosis, neurolysis or nerve block for chronic perineal pain syndrome or even ischial osteotomy, a sound knowledge of its anatomy is needed. METHODS. The origin, course and branching pattern of the pudendal nerve regarding its relation with the sacrospinous ligament and the pudendal vessels were investigated in 10 cadavers. The length between its origin and entry point to the Alcock's canal and the distance of it to the ischial spine were measured with a digital caliper. RESULTS. The nerve originated from S2-S3 (75%) on 15 sides; S2 to S4 (10%) on 2 sides; S3-S4 (5%), S1 to S3 (5%) and S3 to S5 (5%) on 1 side each, respectively. The mean length of the nerve was 39.2mm (27.3-51.6mm). The nerve passed lateral to the ischial spine on 16 sides and medial on 4 sides. The mean distances were 2.9mm (0.8-4.4mm) and 2.4mm (1.05-3.4mm), respectively. The nerve was classified into 3 types regarding its branching pattern and the relation of its branches to the sacrospinous ligament. Type I was defined as a single trunk (10%), Type II as double trunk (60%), and Type III as triple trunk (30%). CONCLUSIONS. This study outlines the topographic anatomy of the pudendal nerve and can be of importance for related procedures.

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"Cadaver Camp": A guided dissection experience for high school anatomy and physiology teachers to promote a deeper understanding of obesity and its impact on human structure.

INTRODUCTION. Fifteen high school anatomy instructors took part in a weekend of cadaver dissection workshops designed to enrich their teaching about the anatomy and physiology of the human gastrointestinal tract. METHODS. Although 75% of the attendees had no prior experience with a human cadaver lab, all were experienced teachers using dissection in their teaching of anatomy. RESULTS: All of the teachers found the experience to be "transformative." CONCLUSIONS. Clinical anatomy outreach to secondary school teachers who teach important advanced placement or college credit courses in high school courses is an effective means to provide access to and guidance in a human cadaveric dissection experience. Furthermore, as our experience showed, such outreach can also serve to "close the gap" in several critical areas of focus between the university undergraduate and advanced placement secondary education levels. While we all must seek and meet out students at their level of understanding, such outreach "camps" provide a unique and pleasurable educational opportunity to serve a highly-motivated, interactive, and interactive group of fellow anatomy educators.

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Peer teaching and learning in anatomy practical classes.

INTRODUCTION. Changes in medical education, including integration of the clinical and basic sciences curricula, present an opportunity to re-assess how anatomy is best taught. Using peer teaching and learning in anatomy practical classes offers a promising pedagogical approach to increase students’ understanding of the content and ability to apply this to real-life, clinical contexts. METHODS. This peer teaching activity utilised the "jigsaw teaching" method and was conducted during the first year of a graduate-entry medical degree, in the anatomy practical class for kidneys and ureters. Students were divided into six groups and provided with task cards, focus questions, resources and the assistance of the tutors. After the allotted time, one member of each group met with a representative from each of the other groups and presented the information required. Utilising the Quality Teaching Framework, qualitative data analysis, including student feedback, focus groups, and observation of group work, was conducted. RESULTS. Overall, students engaged well with the activity and most students stated they understood this content “more than usual”; however, students reportedly understood the
content they taught their peers more than the content they learnt from their peers. Peer activities were considered “intimidating” only by students who indicated low or average confidence in anatomy, and “too restrictive” only by students who indicated high confidence in anatomy. CONCLUSIONS. The student-centred approach of peer teaching is valuable as part of a repertoire of teaching methods, to provide an effective learning environment and cater for a wide range of learning styles. It also promotes communication and teamwork, skills that are particularly relevant in medical practice.

MARSHALL, Ewarld, Georgios SPENTZOURIS, Mitchel MUHLEMAN, Kitt SHAFFER, R. Shane TUBBS, Jerzy GIELECKI, and Marios LOUKAS. St. George’s University, St. George’s, Grenada, West Indies. The clinical anatomy of the inferior vena cava.

INTRODUCTION. Anomalies in the course and drainage of the inferior vena cava (IVC) may complicate normal functioning, correct diagnosis, and therapeutic interventions within the abdomen. METHODS. In this meta-analysis, we will present and discuss the most common variations and abnormalities of the IVC, as well as the potential clinical problems. RESULTS. Development of the IVC begins in the 6th week and, due to its developmental complexity, there are many opportunities for malformations to occur with associated clinical pathologies. While many IVC anomalies are discovered incidentally on abdominal imaging, aberrations may be responsible for formation of thrombosis, back pain, and anomalous circulation of blood to the heart. The most common anomalies and variations include: persistent left IVC, duplicated IVC, situs inversus, retro or circumaortic left renal vein, and agenesis of the IVC. CONCLUSIONS. While these anatomical variations are often clinically silent and discovered incidentally, the physiological compensations for venous return through collateral vessels has been implicated in DVT formation, atypical lower back pain, and hematoma formation. Recurrent venous thromboembolism may be higher and post-thrombotic syndrome more severe in patients with aberrancies of the IVC.


INTRODUCTION. Left hepatic part of the liver is commonly used in liver transplantation. Knowledge distribution of the intraparenchymatous typologies of left branch of hepatic portal vein and its branches becomes very important. METHODS. On 150 liver corrosion casts I analyzed the intraparenchymatous distribution of the portal items. The corrosion casts were performed by injecting the vasculo-ductal systems with plastic mass, followed by corrosion of the parenchyma. RESULTS. I have highlighted four morphological types of hepatic portal vein left branch, with its origin in the portal hepatic vein trunk, as following: forking in: (i) left and right branch (96%), (ii) forking in left, anterior and posterior branch (2%), (iii) forking in anterior and posterior branch and with the origin of the left branch from the first part of the anterior branch (0.67%) and (iv) forking in left and posterior branch, with the origin of the anterior branch from the transverse part of the left branch (1.33%). In 98.67% of cases the left branch of the hepatic portal vein serves two divisions of the hepatic parenchyma (left lateral division and left medial division), and in 1.33% of cases three divisions (left lateral division. Left medial division and right medial division). CONCLUSIONS. Morphological knowledge of the intraparenchymatous distribution of the left branch of hepatic portal vein helps the planning and achievement of liver transplantation.

MIRJALILI, S.A., S.L. MCFADDEN, B. WILSON, T.M. BUCKENHAM, and M.D. STRINGER. Department of Anatomy, University of Otago, Dunedin, New Zealand. Abdominal surface anatomy - have we got it right?
INTRODUCTION. There are many inconsistencies in clinically important surface markings between and within anatomical reference texts. The aim of this study was to investigate the surface anatomy of major vascular structures, kidneys and spleen in living adults using computed tomography (CT). METHODS. After excluding patients with large space-occupying lesions, scoliosis/abnormal lordosis, and hepatosplenomegaly, 108 abdominal CT scans of supine adults (64 female, age range 18-97 years) were analyzed by dual consensus reporting to determine the surface anatomy of major vascular structures, kidneys and spleen. RESULTS. The vertebral level of the aorta, its bifurcation and major branches, and the origin of the inferior vena cava were consistent with current descriptions. However, the renal arteries were most commonly at the level of L1 (left 64%, right 43%) rather than L2. The right kidney was most commonly positioned between L1-L4 (55%) and the left between T12-L3 (40%); the renal hila of both kidneys were most often at L2 (left 39%, right 55%). The long axis of the spleen was most frequently in line with the 11th rib (55%) rather than the 10th (32%). CONCLUSIONS. Standard descriptions of abdominal vascular surface landmarks are generally accurate except for the vertebral level of the renal arteries which is most commonly L1. However, the surface anatomy of the kidneys and spleen needs to be revised in the light of findings from modern imaging techniques in living subjects. Variations related to gender, age, ethnicity, BMI and posture must also be considered when reporting surface anatomy.

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Danatomy: a digital teaching tool designed to help students learn and review skeletal anatomy.

INTRODUCTION. Anatomical study of the skeletal system can often be challenging for students in anatomy courses, especially when students must study outside of an anatomy laboratory setting where skeletal specimens are not readily available. METHODS. To develop an easy to use, interactive digital teaching tool designed to help students learn and review skeletal anatomy. RESULTS. Digital teaching and review presentations of the skeletal system were developed using labeled and color-coded high quality digital photos of skeletal structures. The digital photos were edited and imported into interactive presentations that students could access online and download to their computers, tablets, and smartphones. CONCLUSIONS. Danatomy is an interactive digital teaching tool that can be used by students both inside and outside of a traditional anatomy laboratory setting. This accessibility, as well as the high quality digital photos, color-coded labeling method and user friendly interface make danatomy an effective teaching tool for students learning and reviewing the anatomy of the skeletal system.

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Strategies to increase students’ interactivity in histology laboratory: A new medical school experience.

INTRODUCTION. To facilitate individualized and group learning and to engage our medical students in the histology laboratory experience, we designed and developed an electronic laboratory manual to increase the effectiveness and efficiency of laboratory instruction. METHODS. Faculty have the opportunity to increase the level of student engagement, and thus, improve their problem-solving and critical thinking abilities. The electronic laboratory manual includes an authoring tool that enables faculty to design and create activities to enhance the collaborative learning environment. The authoring tool allows faculty to either choose from a pre-set of templates or design their own layout for the learning activity. Using this methodology, they can guide students through several different types of activities. These learning activities include instructions to navigate virtual slides, select and label images, solve exercises/quizzes to help students monitor their learning, and explain cases for clinical relevance. Student groups
were subdivided into subgroups of three each, and provided with a large screen monitor. To implement the interactive teaching strategies, as a group, students select the intended fields within the virtual slides, capture the images, upload and label the images, and solve exercises and clinical cases. Finally, students generate a laboratory report to share with faculty and other subgroups for feedback. To assess the instructional value of the manual, a questionnaire was administered to collect data about student perception using the electronic laboratory manual.

RESULTS and CONCLUSIONS. The laboratory activity was seen to improve understanding, provoke active learning style, facilitate group learning, and support self-monitoring of student learning.

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Incorporating service learning in the anatomical sciences curriculum.

INTRODUCTION. Service learning is a form of project based learning that enhances the student’s assimilation and integration of the course material in a way that is not possible in the classroom. In service learning, the motivation for taking ownership of the project is the act of helping other people, which is relevant to students in health care fields. METHODS. University students presented anatomy material from their lecture course to high school and middle school students in the urban environment. Effectiveness of the program for the urban students was assessed by pre and post tests and by feedback from the instructors and students. Effectiveness of the program for the university students was assessed by comparing the scores of presenters on exam questions related to their topic to the scores of the rest of the class. RESULTS. University students gained experience in presentation skills, an appreciation for teaching in the urban environment, and the depth of knowledge that only comes from teaching. Students in the client institutions were able to see that the material taught in their course is relevant and valued outside of their classroom, that people from different ethnic and social economic groups can work together to accomplish something worthwhile, and that many university students are similar to themselves in age and ethnicity. These lessons help them to visualize the possibility of attending an institution of higher learning. The pre and post test results were significantly different at both institutions (p<.001). Comments from instructors and students at the client institutions were overwhelmingly positive. CONCLUSIONS. We were pleased to find that the incorporation of this service-learning project was a beneficial experience for almost everyone involved.

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Anatomical considerations of tameshigiri: test-cutting with blades in historical Japan.

INTRODUCTION. Tameshigiri was a historical practice of testing the quality of Japanese blades by cutting bundles of rice or the bodies of executed criminals. By 1600, the practice (also known as suemonokir) had become commonplace but disappeared entirely in the late 1800s. Certain routine cuts, which varied in their difficulty, were prescribed for testing blades. This poster uses images gathered from the visible human project to demonstrate the anatomical structures that would have likely been involved in these different cuts. METHODS. The name, placement, and difficulty of each cut were taken from the seminal work on this topic in English, The Sword and Samé (1963) by Henri L. Joly and Inada Hogitaro. The visible human slice viewer (http://visiblehuman.epfl.ch/stdappletv2.php) was accessed to create a “slice” that replicated each of the cuts. RESULTS. Each of the tameshigiri cuts from the text was recreated and the anatomical structures involved were created. The difficulty of each cut correlated with the depth of soft tissue and bone that were encountered from tai-tai (easiest cut) to san no do (most difficult). CONCLUSIONS. An anatomical investigation of the practice of tameshigiri
illuminates the reason each cut was more or less difficult than others. Each cut was able to test different aspects of blade quality.

ZHENG, Lu, Stanley HUNG, Christine WALTON, Amr W. ELMARAGHY, Kajeandra RAVICHANDIRAN, and Anne AGUR. Department of Surgery, University of Toronto, Toronto, ON, MSS 1A8, CA. A 3D modelling study of the musculotendinous architecture of the distal biceps brachii in humans.

INTRODUCTION. The musculotendinous junction of the human biceps brachii muscle is important in surgical management of distal biceps tendon rupture. While previous anatomic studies have focused on tendon insertion and radial tuberosity morphology, the characteristics of the musculotendinous junction remain poorly defined. PURPOSE. To examine and characterize the musculotendinous junction of the human biceps brachii muscle. METHODS. In this on-going study, three formalin-embalmed cadaveric specimens have been examined. The distal transition of muscle fiber bundles to aponeurosis of both the short and long heads was digitized volumetrically using a MicroScribeTM 3D-X digitizer and collected data modeled using Autodesk® Maya® 2012. RESULTS. The musculotendinous junction measured approximately 64.2 ± 5.0mm (length) by 15.2 ± 5.1mm (width). The shape was trapezoidal with a more narrow proximal extension of the aponeurosis. The superficial fibers of the long and short heads attached more distally on the aponeurosis, whereas the deeper fibers attached more proximally. The fiber bundles of the short head attached to the medial portion of the aponeurosis, and the long head more laterally occupying 55% and 45% of the surface area of the aponeurosis, respectively. The fibre bundles of the short head attached only to the anterior aspect of the medial portion of the aponeurosis, whereas those of the long head attached primarily to the posterior aspect of the lateral portion. CONCLUSIONS. The aponeurotic distribution in the distal musculotendinous junction of the human biceps brachii has been characterized here. This knowledge is important for surgical management of distal biceps tendon ruptures, improving suture grasping techniques and augmenting the strength of the repair.