

**The 21<sup>st</sup>  
Annual Meeting  
of the  
American Association  
of Clinical Anatomists**



**June 8-12, 2004  
Moraga, CA**

jointly sponsored by

**St. Mary's College of California  
and the  
American Association of Clinical Anatomists**



## **About the Cover Illustration**

### **The Chapel at St. Mary's College of California**

Saint Mary's College of California is one of the oldest and most distinguished colleges in the West. The original campus was dedicated in 1863 and then moved to Oakland in 1889. The current St. Mary's campus was dedicated in 1927 after the Oakland school was destroyed in a fire. The College is run by the Christian Brothers (Fratres Scholarum Christianarum, F.S.C.). The Christian Brothers Order was founded by Saint John Baptist De La Salle in 1680 in Rheims, France during the opulent reign of Louis XIV. De La Salle created his original school to educate the sons of the poor and working class. Today, there are over 7000 Christian Brothers, who along with 76,000 colleagues in 81 countries, educate some 900,000 students around the world.

The chapel of the College, as seen in this drawing, is modeled after the cathedral of Cuernavaca in Mexico. The nave is designed from the cathedral of Monreale in Sicily. The architecture style is Mission Revival. The windows of the chapel were not installed until 1929 when they arrived from Aachen, Germany. Built in 1927, the chapel and College were blessed by the Archbishop in the fall of 1928.

# **The American Association of Clinical Anatomists**



The object of the Association shall be to advance the science and art of Clinical Anatomy, to encourage research and publication in the field and to maintain high standards in the teaching of Anatomy.

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# ***Clinical Anatomy***

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

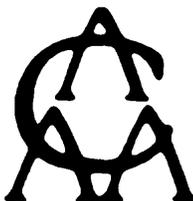
**Editor-in-Chief** - Stephen W. Carmichael  
**AACA Co-Editors** – Robert J. Spinner and Mark F. Seifert  
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## **Editorial Board - 2004**

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		Gary E. Wise



## **Annual Banquet**

Thursday June 10, 2004

Presentation of *Honored Member Award*  
to

***John V. Basmajian, M.D.***

Presentation of *R. Benton Adkins, Jr. Distinguished Service Award*  
to

***Robert J. Leonard, Ph.D.***

Oliver Hall  
St. Mary's College of California

6:30 pm - Reception (hosted bar)

7:00 pm - Dinner and presentation of *Honored Member Award* to  
**John V. Basmajian** (in absentia) and the *R. Benton Adkins, Jr.*  
*Distinguished Service Award* to **Robert J. Leonard**.

The \$175 registration fee paid by attendees includes the cost of the  
Scientific Program and the Banquet. The spouse or guest of a  
registrant is welcome to attend the banquet. Additional tickets are  
available at a cost of \$35.

## Previous Honored Members

\*W. Henry Hollinshead, 1984  
\*Chester B. McVay, 1985  
\*Donald James Gray, 1986  
\*Russell T. Woodburne, 1987  
Oliver Beahrs, 1988  
N. Alan Green, 1989  
\*Frank H. Netter, 1990  
Ralph Ger, 1991  
M. Roy Schwartz, 1992  
Carmine D. Clemente, 1993  
Keith L. Moore, 1994  
Roy J. Scothorne, 1995  
Robert A. Chase, 1996  
Tatsuo Sato, 1997  
John E. Skandalakis, 1998  
Donald R. Cahill, 1999  
\*Sandy C. Marks, Jr., 2000  
David G. Whitlock, 2001  
Robert D. Acland, 2002  
Arthur F. Dalley, II, 2003

\* deceased

## Honored Member, 2004



### The American Association of Clinical Anatomists

recognizes and awards  
Honored Membership to

## John V. Basmajian, M.D.

Clinical Anatomist • Educator • Scientist • Author

For his distinguished career in, and enthusiasm for, clinically-relevant anatomy, his active role in anatomical instruction to medical and therapy students, and particularly in recognition of his pioneering research into muscle control mechanisms in health and disease.

Awarded at the 21<sup>st</sup> Annual Meeting of the AACA, Moraga,  
California, June 10, 2004.

**R. Benton Adkins Jr.  
Distinguished Service Award  
2004**



**The American Association of Clinical Anatomists**

recognizes and awards the  
R. Benton Adkins Jr. Distinguished Service Award to

**Robert J. Leonard, Ph.D.**

For his outstanding record of service to the Association,  
as Councilor, Secretary, Chair of Educational Affairs,  
AACA Editor of *Clinical Anatomy*, and for his dedication  
and enthusiasm for the clinical application of anatomy.

Awarded at the Twenty-first Annual Meeting of the AACA  
Moraga, California, June 10, 2004.

# **Career Development Committee Symposium**

Tuesday, June 8<sup>th</sup> 1:00-4:30 p.m., *Moraga Room, Soda Center*

## **“Anatomy Education Research in Focus”**

### **Developing Skills to Succeed at Educational Grant and Proposal Writing**

#### **Symposium Speakers**

**Donald P. Jenkins, Ph.D.:** Senior Research Fellow and Resident Anatomist, Lister Hill National Center for Biomedical Communications, National Library of Medicine, the National Institutes of Health; former Deputy Director of the Defense Sciences Office of DARPA; Visiting Professor of Anatomy at the Uniformed Services University of the Health Sciences.

**John Boker, Ph.D.:** Professor of Family Medicine, is Director of Research in Medical Education at the University of California, Irvine, College of Medicine. He has had a 30-year career in medical education research, with a focus on innovative instructional interventions; more than 60 such programs were supported by external funding.

**Victor Spitzer, Ph.D.:** Associate Professor in Cell & Developmental Biology at University of Colorado -- Director of the Center for Human Simulation. He has had significant involvement in the Visible Human project as an anatomical platform for human simulation and the new age of medical education.

**Elizabeth Lockett:** Medical Illustrator, Collections Manager for the Human Developmental Anatomy Center, National Museum of Health and Medicine of the Armed Forces Institute of Pathology, Washington D.C.

#### **The Mentor Program Social**

4:30-5:30 p.m., *Moraga Room, Soda Center*

## The 2004 Presidential Speaker

**Dr. Tim White**, distinguished paleoanthropologist, will present this year's Presidential Paper with a talk entitled "*Evolution of Human Anatomy, A View from Afar*" on Wednesday afternoon, June 9, 2004. Dr. White is a Professor of Integrative Biology and a Co-Director of the Laboratory for Human Evolutionary Studies at the University of California at Berkeley.



Early in his career, Dr. White worked with Richard Leakey in Kenya and later helped excavate the famous hominid fossil footprints at Laetoli, Tanzania. After accepting a position at UC Berkeley, he also collaborated with Donald Johanson, the discoverer of "Lucy". Among his many contributions to hominid evolution, Dr. White has uncovered three significant hominid fossils. In the early 1990's, he and his colleagues discovered *Ardipithecus ramidus* that dated at 4.4 million years old and was, at the time, the oldest known human ancestor. Dr. White proposed that the fossil evidence of *A. ramidus* indicated that hominids began walking upright in a forested environment and not on the savannas as had previously been believed.

This past summer, Dr. White announced the discovery of three *Homo sapiens* skulls that his team found in 1997 near the Afar rift valley village of Herto, Ethiopia. The date of these skulls, 160,000 years, coincides nicely with the prediction, based on genetic variation, that humans migrated from Africa around this time, the so-called out-of-Africa theory. The skulls fill in an archeological gap in human evolution and share features with both modern humans and an ancient ancestor. Because of these shared features, the team assigned the hominid to a new subspecies, *Homo sapiens idaltu*.

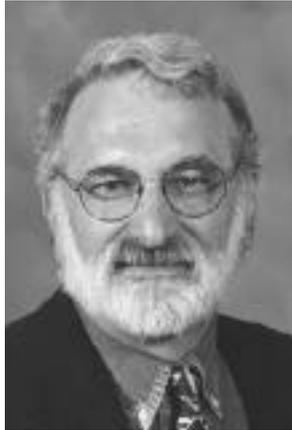
In his talk to the Association, Dr. White will show how he uses anatomy to analyze the fossils that he finds and how the grouping of our ancestors is based on anatomic variation.

# **Educational Affairs Committee Symposium**

*Sponsored by **ICON Learning Systems**  
Co-chaired by American Association of Anatomists*

Thursday, June 10<sup>th</sup> 2004 from 3:15 - 5:15 p.m.  
Please join us for a lecture on medical education entitled

**“How Do Students “Learn to Learn” in Medical School? (And You Think All You’re Teaching is Human Anatomy)?”.**



**Hank B. Slotnick, PhD, PhD**, is a leader in the field of physician learning and holds doctorates in both education and applied statistics. Dr. Slotnick is professor emeritus at the University of North Dakota School of Medicine, and is Visiting Professor, at the University of Wisconsin-Madison Medical School. For the past decade-and-a-half, he has been researching physician learning with the result that he's published on topics ranging from the epidemiology of physician learning through learning theory. He and a colleague currently have a paper in press on proto-

professionalism--the development of medical students, residents, and then new-into-independent-practice physicians as they mature into medical professionals.

Dr. Slotnick and his graduate student have recently finished a study on how first year medical students learn to learn in medical school. His presentation at this meeting will be the first release of their findings showing how pre-med approaches to learning must be renovated to accommodate to the exigencies of medical school, how first year students make the accommodation, how first year learning activities relate to/fail to relate to learning done by clinicians, and the critical role played by gross anatomy in the students' maturations as learners.

Also, please join us for  
**"Breakfast with the experts"**  
Friday, June 11, 2004 from 7:30-8:30 AM

# **Anatomical Services Committee Symposium**

## **“Donor Program Management: Legal, Financial and Operational Considerations”**

Friday, June 11<sup>th</sup>, 9:45 a.m. - 12:30 p.m.

9:45-10:15 a.m. - **Louis M. Marlin, JD**, principal attorney with the law offices of Marlin and Saltzman with offices in Orange and Los Angeles County who will speak on the legal concerns of operating a university affiliated Willed Body Program.

10:15-10:45 a.m. - **Marsha Murphy**, Director of Internal Audit Services at the University of California, Irvine who will speak about financial, operational, compliance and safety risks of willed body programs and effective audit practices based on compliance controls.

10:45- 11:15 a.m. - **Tom Tempske**, Laboratory Examiner for the State of California, Department of Health Services, Laboratory Field Services/Tissue Bank Licensing, Mr. Tempske, will discuss human tissue and body brokering with specific case examples.

11:15-11:30 a.m. Break

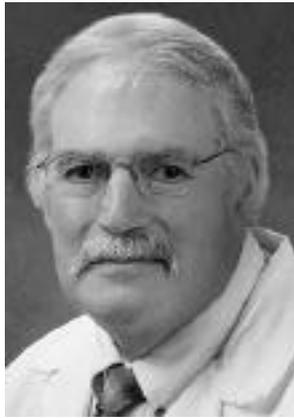
11:30-12:30 p.m. Panel Discussion

The ASC expects informative and highly applicable discussions as a result of current donor program issues and events nationwide. Please come and contribute with your presence and feedback.

# ***New Concepts in Anatomy***

## **“The Helical Heart”**

Friday, June 11<sup>th</sup>, 8:30 – 9:30 a.m.



**Dr. Gerald D. Buckberg** is a Professor of Cardiac Surgery at the David Geffen School of Medicine at UCLA. Dr. Buckberg had initial interests focused upon heart protection during open heart surgery. His blood cardioplegia method is used by over 85% of surgeons world-wide, together with innovative added concepts and methods of delivery and amino acid enrichment of protective solutions. Strategies were advanced to develop new approaches of treating acute myocardial infarction (reversing previously irreversible damage after over 6 hours of ischemia) with 87% functional recovery, and reducing mortality of cardiogenic shock from 50% to 10%. Recent new understanding of the geometric cause of congestive heart failure led to his developing of the international RESTORE team, where an 89% 3 year survival rate and 89% freedom from re-hospitalization was found in over 1,100 patients. Recent studies of a new innovative cardiac model led to a novel approach to understanding the helical heart's structure and function that started a potential revolution in concepts in basic and clinical science.



The AACCA is very pleased that Dr. Buckberg was able to attend the 21<sup>st</sup> Annual Scientific Session to present one of the most revolutionary new discoveries in anatomy.

## 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 the *Clays Lounge, Soda Center*. Please refer to the loose materials in your registration packet for an up-to-date listing, including sponsors who have registered after the date of this printing.

**Bacus Laboratory**  
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**Touch of Life Technologies**

## 21<sup>st</sup> Annual Meeting of the American Association of Clinical Anatomists

June 8 - 12, 2004  
St. Mary's College of California  
Moraga, CA

### Pre-Conference Activities

#### Tuesday, June 8, 2004

- 8:00 a.m. - 9:30a.m. **Journal Committee Meeting** - (members of Journal Committee) - *Founders' Dining Room*.
- 9:00 a.m. – 5:45 p.m. **Registration/Check-In** - *Conference Desk, Soda Center Foyer*
- 9:30 a.m. – 5:00 p.m. **Council Meeting** - (AACCA Officers and Councilors) – *Founders' Dining Room*.

Tuesday, June 8<sup>th</sup>

- 1:00 p.m. – 4:30 p.m. **Career Development Committee Symposium:** “Developing Skills to Succeed at Educational Grant and Proposal Writing” - *Moraga Room, Soda Center*
- 3:00 p.m. **Set-up for Commercial Exhibitors,** *Claeys Lounge, Soda Center.*
- 4:30 -5:30 p.m. **Mentor Program Social Event,** *Moraga Room, Soda Center.*
- 6:00 -8:00 p.m. **Welcome Reception\*** for all meeting attendees and accompanying persons - *Soda Center (heavy hors d.oeuvers and open bar).*

\*St. Mary's College and the AACA gratefully acknowledge an unrestricted educational grant from **Wiley-Liss, Inc.** for support of the Welcome Reception.

## Scientific Session Wednesday - Friday

Wednesday, June 9, 2004

- 7:00 -8:45 a.m. **Editorial Board Breakfast Meeting for Editors/ Associate Editors of *Clinical Anatomy - Founders' Dining Room.***
- 7:30-4:00 p.m. **Registration - Conference Service Area  
Commercial Exhibits - Claeys Lounge, Soda Center.**
- 7:30-9:00 a.m. **Breakfast – Oliver Hall**
- 8:00 a.m. **Bus departs for Accompanying Persons' Program.** Sightseeing trip to Napa Valley.
- 9:00 a.m.- 4:30 p.m. **Poster Session I – Claeys Lounge, Soda Center.**

*All posters listed below will be on display throughout Wednesday, 9:00 a.m. to 4:30 p.m. **Presenters of even-numbered posters must be present at their posters during the morning refreshment break, those presenting odd numbered posters must be present during the afternoon refreshment break.***

*\* preceding the poster number indicates the presentation is in the Predoctoral Award Competition.*

- 01 -** Anatomical considerations of the pediatric ilioinguinal/ iliohypogastric nerve block. <sup>1</sup>ABRAHAMS, Peter H., <sup>2</sup>Albert N. Van SCHOOR\*, <sup>2</sup>Johannes M. BOON\*, <sup>3</sup>Adrian T. BOSENBERG\*, <sup>2</sup>Johannes H. MEIRING. <sup>1</sup>Kigezi International School of Medicine, Cambridge, Girton College, Cambridge, UNITED KINGDOM, St George's University Grenada and St Vincent, WEST INDIES. <sup>2</sup>Department of Anatomy, Section of Clinical Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, and <sup>3</sup>Department of Anaesthesia, Faculty of Health Sciences, University of Cape Town, SOUTH AFRICA.
- 02 -** Attachment of adductors to the pubic symphysis: a consideration in the diagnosis of groin pain in athletes. AGUR, Anne, Fateme SALEHI\*, and Philip ROBINSON\*. Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, Ontario, CANADA, and Department of Radiology, St James University Hospital, Leeds, UNITED KINGDOM.
- \*03 -** Students emotions and reaction to cadaver dissection. ANDREADIS, Athena\*, Bina VORA\*, and Marios LOUKAS. Department of Anatomy, American University of the Caribbean., Saint Maarten, NEDERLAND ANTILLES.
- \*04 -** The anatomy of the right and left atrial appendage. ARORA, Shagun<sup>1\*</sup> and Marios LOUKAS<sup>1,2</sup>. Department of Anatomy, American University of the Caribbean, Saint Maarten, NA. Harvard Medical School, Boston, MA.
- \*05 -** The clinical significance of suprascapular nerve mobilization. BODILY\*, Kale D., Robert J. SPINNER, Alexander Y. SHIN\*, Allen T. BISHOP\*. Mayo Clinic, Department of Orthopedics, Rochester, MN.

- \*06 -** BURGOON, Jennifer M., Diane C. CALLESON\*, and Noelle A. GRANGER. University of North Carolina School of Medicine, Chapel Hill, NC. Does medical student self-efficacy for the human anatomy curriculum continue to increase after the beginning weeks of coursework?
- 07 -** Transarticular invasion of bone tumours across the sacroiliac joint. CHHAYA\*, Sam A., Lawrence WHITE\*, and Anne M.R. AGUR. Department of Medical Imaging, Mount Sinai and University Health Network and Division of Anatomy, Department of Surgery, University of Toronto, ON, CANADA.
- 08 -** Bilateral MRI, MRA AND MRV displays venous compression and collateral drainage from vascular compression in thoracic outlet syndrome (TOS) and migraine patients. COLLINS, James D., Ernestina H. SAXTON\*, Samuel S. AHN\*, Theodore Q. MILLER\*, Alfred CARNES\*. Departments of Neurology, Radiological Sciences, and Vascular Surgery, UCLA School of Medicine, Los Angeles, CA.
- 09 -** The use of fresh tissue cadavers to examine the distribution of India ink in a Maxillary division nerve block. DOBBS\*, Ryan, Timothy P. McVANEY\*, Laura C. BARRITT, and Neil S. NORTON. Departments of Oral Biology and Oral Surgery, School of Dentistry, Creighton University, Omaha, NE.
- 10 -** Multiple bilateral anomalies of the brachial plexus and axillary artery: a cadaver dissection case. DOWNIE, Sherry A.<sup>1,2</sup>, Daniel S. FINK\*<sup>3</sup>, Michael P. JONES\*<sup>3</sup>, Noemi RIGOL\*<sup>3</sup>, Eliyahu C. ROSMAN\*<sup>3</sup>, Todd R. OLSON<sup>1</sup>. <sup>1</sup>Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. <sup>2</sup>Division of Natural Sciences, Mercy College, Dobbs Ferry, NY. <sup>3</sup>Class of 2007, Albert Einstein College of Medicine, Bronx, NY.
- \*11 -** The clinical anatomy of the auriculotemporal nerve. ESMAEILI Ehsan<sup>1\*</sup>, Theodoros KAPOUS<sup>2\*</sup>, Mariusz WRZOSEK<sup>2\*</sup>, Marios LOUKAS<sup>1,3</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA. <sup>2</sup>Harvard School of Dental Medicine, <sup>3</sup>Harvard Medical School, Boston, MA.

- \*12 -** The anatomy of the maxillary artery with special emphasis to pterygopalatine artery. ESMAEILI Ehsan<sup>1\*</sup>, Theodoros KAPOS<sup>2\*</sup>, Mariusz WRZOSEK<sup>2\*</sup>, and Marios LOUKAS<sup>1,2</sup>.  
<sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA. <sup>2</sup>Harvard School of Dental Medicine, and <sup>3</sup>Harvard Medical School, Boston, MA.
- 13 -** Student responses to the cadaver lab. FITZSIMMONS John M.<sup>1</sup>, Bina VORA<sup>2</sup>, and Marios LOUKAS<sup>1,2</sup>, Department of Radiology, <sup>1</sup>Michigan State University, MI and <sup>2</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten NA.
- 14 -** Functional anatomy classes for science students designed to facilitate application of knowledge and develop professional scientific skills. FOGG, Quentin A., Ian L. GIBBINS\*. Department of Anatomy and Histology, Flinders University, Adelaide, AUSTRALIA.
- 15 -** Histologic differentiation of macroscopically indistinct tissues: ligament and joint capsule of the wrist. FOGG, Quentin A.<sup>1,3</sup>, Gregory I. BAIN<sup>\*2</sup>, and Raymond A. TEDMAN<sup>\*3</sup>.  
<sup>1</sup>Department of Anatomy and Histology, Flinders University, Adelaide, Australia; <sup>2</sup>Modbury Public Hospital, Adelaide, Australia; <sup>3</sup>Department of Anatomical Sciences, the University of Adelaide, Adelaide, AUSTRALIA.
- \*16 -** Retroesophageal and retrotracheal subclavian arteries. GASPARD, Josh<sup>1\*</sup> and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard Medical School, Boston, MA.
- 17 -** Clinical and diagnostic implications of the fetal basilar artery morphology. GIELECKI\*, Jerzy St., and Anna ZURADA\*. Department of Anatomy, Silesian Medical University, POLAND.
- \*18 -** Arterial supply of the DCIA flap. GOLDIE, Stephen J., Richard THOMPSON\*, David SOUTAR\*, John SHAW-DUNN\*. Department of Human Anatomy, University of Glasgow, and Canniesburn Plastic Surgery Unit, Glasgow Royal Infirmary, Glasgow, UNITED KINGDOM.

- 19 - A unique origin of the inferior alveolar artery. JERGENSON, Margaret A., Neil S. NORTON, and Laura C. BARRITT. Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE.
- 20 - A case study of club hand and its clinical significance. JEVOOR, Praful S., Sharad M. ANTIN\* and Rajesh POWAR.\* Department of Anatomy and Orthopaedics, Jawaharlal Nehru Medical College, Belgaum. INDIA.
- 21 - Etiological and clinical study of congenital absence of thumb. JEVOOR, Praful S., Sharad M. ANTIN\* and Rajesh POWAR.\* Department of Anatomy and Orthopaedics, Jawaharlal Nehru Medical College, Belgaum. INDIA.
- \*22 - Zygomaticofacial, zygomaticoorbital and zygomatico-temporal foramina, an anatomic study. JIDDOU, Monica<sup>1\*</sup>, Theodoros KAPOUS<sup>2\*</sup>, and Marios LOUKAS<sup>1,3</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard School of Dental Medicine, and <sup>3</sup>Harvard Medical School, Boston, MA.
- \*23 - An anatomical re-examination of lateral thoracic artery. JONES<sup>1</sup>, Ashley\*, Paul TRISLER<sup>1\*</sup>, Mark LOW<sup>1\*</sup>, Beaux Van SLAUGHTER<sup>1\*</sup>, and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, and <sup>2</sup>Harvard Medical School, Boston, MA.
- \*24 - An anatomic study on the esophageal hiatus and the crura. JOSEPH, Jason<sup>1\*</sup> and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, and <sup>2</sup>Harvard Medical School, Boston, MA.
- 25 - Correlation between size and angle of proximal fibula and distal radius. KHAMANARONG K, Pollasak JEERAVIPOOLWAN\* and Siranan SIRIWAT\* Faculty of Medicine, Khon Kaen University, THAILAND.
- 26 - Radiology in the basic science clinical anatomy lab: an objective measure of this integration. SALKOWSKI<sup>2</sup>, Lonie R., Guillermo F. CARRERA<sup>2</sup>, David L. BOLENDER<sup>1</sup>, and Gary L. KOLESARI<sup>1,3</sup>. Department of Cell Biology, Neurobiology and Anatomy<sup>1</sup>, Department of Radiology<sup>2</sup>, and

Wednesday, June 9<sup>th</sup>

Department of Family and Community Medicine<sup>3</sup>, Medical  
College of Wisconsin, Milwaukee, WI.

- 26A The morphology of craniocervical connective tissue forming the posterior atlanto-occipital membrane. NASH<sup>1</sup>, Lance G., Helen NICHOLSON<sup>1</sup>, Antonio S.J. LEE<sup>1</sup>, Gillian JOHNSON<sup>2</sup>, and Ming ZHANG<sup>1</sup>. <sup>1</sup>Department of Anatomy & Structural Biology, School of Medical Science, and <sup>2</sup>School of Physiotherapy, University of Otago, Dunedin, Dunedin, NEW ZEALAND. (sponsored by B. R. MacPherson).

9:00-9:30 a.m. **Opening Ceremonies /Remarks:** *Moraga Room, Soda Center.*

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

*Brother Craig J. Franz, F.S.C., P.h.D*  
President, Saint Mary's College

*Judd Case, Ph.D.*  
Dean of the School of Science, Saint Mary's College

9:30 a.m. **Scientific Platform Session I** - Larry Ross -  
Moderator. *Moraga Room, Soda Center.*

<sup>+</sup> *preceding the time of presentation indicates it is in the Presidential Travel Award Competition.*

<sup>+</sup>9:30 - A case report on venous anomalies of the neck. **OOMMEN, Anitha**, and Avinash Vasant MAINKAR. Department of Anatomy, K.S.Hegde Medical Academy, Karnataka, Mangalore, SOUTH INDIA.

9:45 - A new device for coniotomy. KLAPPENBERGER\*, Jürgen, Asghar SCHIRI\* pour Tscharlou, and **Wilhelm FIRBAS**. Department of Anatomy, University of Medicine, Vienna, AUSTRIA.

Wednesday, June 9<sup>th</sup>

- +10:00 - Anatomical Basis of Central Venous Catheter Fracture.  
**JENSEN, Mark O.** Department of Surgery, University of North Dakota School of Medicine and Health Sciences, Fargo, ND.
- +10:15 - The gross anatomy of the extrathoracic course of the intercostobrachial nerve. **LOUKAS<sup>1,2</sup>, Marios,** Joel HULLETT<sup>1</sup>, Shelly HOLDMAN<sup>1</sup>, and Danny HOLDMAN<sup>1</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NETHERLAND ANTILLES, and <sup>2</sup>Harvard Medical School, Boston, MA.
- 10:30-11:00 a.m. **Refreshment Break** – browse the posters and commercial exhibits – *Claeys Lounge, Soda Center.*
- +11:00 - The gross anatomy of the inferior phrenic vein. LOUKAS, Marios<sup>1,2,3</sup>, **Robert G. LOUIS, Jr.**<sup>1</sup>, Dorothy WHITE<sup>1</sup>, Joel HULLETT<sup>1</sup>, and Teresa WAGNER<sup>3</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NETHERLAND ANTILLES, <sup>2</sup>Harvard Medical School, Boston, MA, and <sup>3</sup>Department of Pathology, Institute of Rheumatology, Warsaw, POLAND.
- +11:15 - Correlation between the course of the medial plantar artery and the morphology of the abductor hallucis muscle. MACCHI<sup>1</sup>, Veronica, Cesare TIENGO<sup>2</sup>, Andrea PORZIONATO<sup>1</sup>, Francesco MAZZOLENI<sup>2</sup>, Ralph GER<sup>3</sup> and **Raffaele De CARO**<sup>1</sup>. <sup>1</sup>Department of Human Anatomy and Physiology, Section of Anatomy, <sup>2</sup>Clinic of Plastic Surgery, University of Padova, ITALY, <sup>3</sup> Surgery and Anatomy, Great Neck, New York, NY.
- +11:30 - Clinical implications of the anatomical relationship between the pericardicophrenic artery and phrenic nerve: a new perspective. MALAKOVA\*, Olga, Kyle RAREY, and **Lynn ROMRELL.** Department of Anatomy and Cell Biology, University of Florida, Gainesville, FL.
- 12:00 p.m. **Lunch in Oliver Hall.** Browse the posters and commercial exhibits - *Claeys Lounge, Soda Center.*

Wednesday, June 9<sup>th</sup>

1:30 p.m. **Scientific Platform Session II** - Brian R. MacPherson  
– Moderator. *Moraga Room, Soda Center.*

+1:30 - Histotopographic study of the rectourethralis muscle.  
PORZIONATO<sup>1</sup>, Andrea, Veronica MACCHI<sup>1</sup>, Mario GARDI<sup>2</sup>, Anna PARENTI<sup>3</sup> and **Raffaele De CARO**<sup>1</sup>.  
<sup>1</sup>Department of Human Anatomy and Physiology, Section of Anatomy, University of Padova, ITALY. <sup>2</sup>Urological Clinic, Department of Surgical and Oncological Sciences, University of Padua, ITALY. <sup>3</sup>Department of Oncological and Surgical Sciences, Section of Pathologic Anatomy, University of Padova, ITALY.

+1:45 - Easy identifiable bony landmarks as an aid in targeted regional ankle blockade. SCHABORT<sup>1</sup>, D., **J. M. BOON**<sup>1</sup>, P.J. BECKER<sup>2</sup>, J. H. MEIRING<sup>1</sup>. <sup>1</sup>Department of Anatomy, Section of Clinical Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, <sup>2</sup>Unit of Biostatistics, Medical Research Council, Pretoria, SOUTH AFRICA.

+2:00 - Correlated one, two and three-dimensional anatomy.  
**SPITZER, Victor**, Gregory Spitzer, Lee Granas, and David Whitlock. University of Colorado Center for Human Simulation, Aurora, CO.

+2:15 - A novel surgical approach to the carpal tunnel: a cadaveric feasibility study. **TUBBS, R. Shane**, E. George SALTER, James SHEETZ, Steven ZEHREN, Donald H. LEE<sup>\*</sup>, Jean OAKES<sup>\*</sup>, and W. Jerry OAKES<sup>\*</sup>. Departments of Cell Biology, Orthopedics, and Division of Neurosurgery, University of Alabama at Birmingham, Birmingham, AL.

2:30-3:00 p.m. **Refreshment Break** - browse the posters and commercial exhibits - *Claeys Lounge, Soda Center.*

+3:00 - The arterial supply of the interventricular septum of the human heart. **ÜZEL<sup>1</sup>, M.**, and M. von LÜDINGHAUSEN<sup>2</sup>.  
<sup>1</sup>Department of Anatomy, University of Istanbul, Cerrahpasa, K.M. Pasa-Istanbul, TURKEY. <sup>2</sup>Institute of Anatomy and Cell Biology, University of Würzburg, Würzburg, GERMANY.

Wednesday, June 9<sup>th</sup>

\*3:15 - Acquired or congenital accessory joints between basiocciput and atlas/axis in the median plane. **LÜDINGHAUSEN<sup>1</sup>, Michael von**, M. FAHR<sup>1</sup>, A. PRESCHER<sup>2</sup>, G. SCHINDLER<sup>3</sup>, W. KENN<sup>3</sup>, A. WEIGLEIN<sup>4</sup>, K. YOSHIMURA<sup>5</sup>, I. KAGEYAMA<sup>5</sup>, K. KOBAYASHI<sup>5</sup>, M. TSUCHIMOCHI<sup>6</sup>.  
Institute of Anatomy and Cell Biology, University of Würzburg, Würzburg, GERMANY.

\*3:30 - The arteries in the posterior cervical triangle in man. **WEIGLEIN<sup>1</sup>, Andreas**, C. SCHALK<sup>1</sup>, B. MORIGGL<sup>2</sup>, K.H. KÜNZE<sup>2</sup>, U. MÜLLER<sup>3</sup>. <sup>1</sup>Institute of Anatomy Medical University Graz, <sup>2</sup>Institute of Anatomy Innsbruck, AUSTRIA, <sup>3</sup>Anatomische Anstalt, Munich, GERMANY.

\*3:45 - Ulnar tunnel - anatomical features that favor entrapment neuropathy. **RAJGOPAL\***, **Lakshmi**, Lopa A. MEHTA\*, and P. S. Bhuiyan\*. Department of Anatomy, Seth G.S. Medical College and K.E.M. Hospital, Mumbai, INDIA.

4:00-5:00 p.m. **Free Time** - browse the posters and commercial exhibits - *Claeys Lounge, Soda Center.*

4:45 p.m. Bus returns from Accompanying Person's Program trip

5:00-6:00 p.m. **Presidential Paper – Tim White, Ph.D.**, distinguished paleoanthropologist will give a talk entitled "**Evolution of Human Anatomy. A View From Afar**". – *LeFevre Theater.*

6:00-7:30 p.m. **Dinner** - *Oliver Hall.*

## Thursday, June 10, 2004

7:30-9:00 a.m. **Anatomical Services Committee Meeting** – *Dryden Hall* (All interested registrants are invited to attend).

7:30-9:00 a.m. **Career Development Committee Breakfast** – *Dryden Hall.*

7:30-9:00 a.m. **Past President's Breakfast Meeting** - *Oliver Hall.*

Thursday, June 10<sup>th</sup>

- 7:30-9:00 a.m. **Financial Affairs Committee/Treasurer Breakfast Meeting - Oliver Hall.**
- 7:30-9:00 a.m. **Breakfast** – Oliver Hall
- 8:00-4:00 p.m. **Registration/Check-in** – Conference Desk, Soda Center Foyer
- 8:00 a.m. Bus departs for Accompanying Persons' Program. Sightseeing tour to San Francisco.

**Poster Session II** – Claeys Lounge, Soda Center

*All posters listed below will be on display **throughout Thursday, 9:00 a.m. to 4:30 p.m.** **Presenters of even-numbered posters must be present at their posters during the morning refreshment break, those presenting odd numbered posters must be present during the afternoon refreshment break.***

- 26 -** The dynamic of the pathomorphological and microbiological changes in initial reparatory stage of the contemporary gunshot wound. KYALYAN, Gohar P. Department of Human Anatomy, Yerevan State Medical University, Yerevan, ARMENIA.
- 27 -** A morphological technique for exploring neuromuscular topography expressed in the mouse gluteus maximus muscle. LAMPA, Steven J.<sup>1,2</sup>, Srilatha POTLURI<sup>\*2</sup>, Ann S. NORTON<sup>\*2</sup>, Michael B. LASKOWSKI<sup>\*1,2</sup>. <sup>1</sup>Program in Neuroscience, Veterinary Comparative Anatomy, Pharmacology and Physiology, Washington State University, Pullman, WA, and <sup>2</sup>WWAMI Medical Program, University of Idaho, Moscow, ID.
- \*28 -** Reciprocal peer teaching: students teaching students in the gross anatomy laboratory. MARCH, Crystal N.\*, Aaron J. KRYCH\*, Ross E. BRYAN\*, Ben J. PEAKE\*, Wojciech PAWLINA, and Stephen W. CARMICHAEL. Mayo Clinic College of Medicine and Department of Anatomy, Mayo Clinic, Rochester, MN.

- 29 - The segmentation of the left lateral division of the liver. Study on corrosion casts. MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA.
- 30 - The segmentation of the right lateral division of the liver. Study on corrosion casts. MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA.
- 31 - The segmentation of the right medial division of the liver. Study on corrosion casts. MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA.
- 32 - The segmentation of the left medial division of the liver. Study on corrosion casts. MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Mioara V. FARCA URECHE\*, and Agneta Maria C. PUSZTAI\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA.
- 33 - Revisiting nonrotation of the midgut in the cadaver: a case report. NORTON, Neil S., Margaret A. JERGENSON, Alan T. Richards, and Thomas H. QUINN, Departments of Oral Biology and Biomedical Sciences, Schools of Dentistry and Medicine, Creighton University, Omaha, NE.
- 34 - A study on the correlation between the hand length and foot length in humans. OOMMEN, Anitha, A. Maiankar\*, and Tom OOMMEN\*. Department of Anatomy, KSHEMA, Mangalore, Karnataka, INDIA.
- 35 - Muscle architecture of the human gastrocnemius muscle: A comparison of historic, photographic and digitized images. OXORN\*, Valerie M., Anne M. R. AGUR, and Nancy H.

McKEE\*. Divisions of Anatomy and Plastic Surgery,  
Department of Surgery, University of Toronto, ON, CANADA.

- 36 -** Medical human gross anatomy: correlates of performance. PETERSON,\*<sup>1</sup> Cathryn A., and Richard P. TUCKER<sup>2</sup>.  
<sup>1</sup>Department of Physical Therapy, University of the Pacific, Stockton, CA, and <sup>2</sup>University of California at Davis School of Medicine, Department of Cell Biology and Human Anatomy, Davis, CA. (sponsored by B. J. Schmitt).
- \*37 -** Radiologic anatomy of lumbar arteries – clinically oriented study. PIETRASIK<sup>1,4</sup>, Kamil, Leopold BAKON<sup>1,3</sup>, Zbigniew GALAZKA<sup>4</sup>, Ma\_gorzta BRZOZOWSKA<sup>2</sup>, and Bogdan CISZEK<sup>1</sup>. <sup>1</sup>Department of Anatomy, <sup>2</sup>Department of Forensic Medicine, <sup>3</sup>Department of Radiology, <sup>4</sup>Department of General, Vascular and Transplant Surgery, The Medical University of Warsaw, POLAND.
- 38 -** Not just another required course: advancing the effectiveness of undergraduate anatomy education. RAOOF, Ameen, Roy GLOVER\*, Sabine HILDEBRANDT\*, Rakin AHMED\*, and Carla BRYANT\*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, MI.
- 39 -** Increasing graduate student interest and participation in human gross anatomy courses. REEVES, Rustin E., Harold J. SHEEDLO\*, and Rouel S. ROQUE\*. Department of Cell Biology and Genetics, University of North Texas Health Science Center, Fort Worth, TX.
- 40 -** Obstruction of dural sinus venous drainage in thoracic outlet patients with migraine as displayed by magnetic resonance imaging (MRI), angiography (MRA) and venography (MRV). SAXTON\* Ernestina H., James D. COLLINS, Samuel S. AHN\*, Theodore Q. MILLER\*, and Alfred CARNES\*. Departments of Neurology, Radiological Sciences, and Vascular Surgery, UCLA School of Medicine, Los Angeles, CA.
- 41 -** The use of an overhead camera and monitor system in the gross anatomy laboratory. SEIFERT, Mark F., and Ronald

- L. SHEW. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN.
- 42 - Modification of commercially available testing software for computerized histology practical exams. SHEETZ, James H., and John A. CALDWELL\*. Department of Cell Biology and Office of Curriculum Development and Management, University of Alabama School of Medicine, University of Alabama at Birmingham (UAB), Birmingham, AL.
- 43 - Low Bifurcation of the Carotid Artery: Embryologic Basis and Clinical Implications. SNYDER, Mary C\*, and RICHARDS, Alan T. University of Wisconsin Hospital and Clinics, Division of Plastic and Reconstructive Surgery, Madison, WI (MCS) and University of Nebraska Medical Center, Division of Head and Neck Surgery (ATR).
- 44 - Clinical confirmation of the dual innervation of the brachialis muscle. SPINNER, Robert J., Murali SUNDARAM\*. Mayo Clinic, Departments of Neurologic Surgery and Radiology, Rochester, MN.
- 45 - An examination of arginine vasotocin expression in sensory structures of zebrafish, *Danio rerio*, embryos. STIEGLER, Travis<sup>1</sup>, Matthew GROBER<sup>2</sup> and Ann POZNANSKI<sup>1</sup>. <sup>1</sup>Midwestern University, Glendale, AZ; <sup>2</sup>Georgia State University, Atlanta, GA.
- \*46 - The location and the morphology of the celiac ganglion. STEWART, Lynsey<sup>1\*</sup>, Tara ORLANDO<sup>1\*</sup>, and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, Harvard Medical School, Boston, MA.
- 47 - Position of the mental foramen in an Asian population. SUBRAMANIAM, Krishnan. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, MALAYSIA.
- \*48 - Veins of Retzius, an anatomical study. SWARTZ, Brandon<sup>1\*</sup> and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American

Thursday, June 10<sup>th</sup>

University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard Medical School, Boston, MA.

- \*49 - The clinical significance of crista terminalis. TONGSON, Jon<sup>1\*</sup> and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard Medical School, Boston, MA.
  
- 50 - Sir Felix Semon and Semon's Law. VILENSKY, Joel A. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Fort Wayne, IN.
  
- \*51 - A qualitative characterization of the learning strategies used by successful veterinary students in a first year gross anatomy course. WARD<sup>1</sup>, Peter J., and James J. WALKER<sup>1,2</sup>. <sup>1</sup>Department of Basic Medical Sciences, Purdue University, IN and <sup>2</sup>Lafayette Center for Medical Education, Indiana University School of Medicine.
  
- 52 - Specific aspects of the renal parenchyma drainage in the case of a single renal vein. Study on corrosion casts. ZAHOI, D. Delia Elena\*, Petru L. MATUSZ, Agneta Maria C. PUSZTAI\*, Mioara V. FARCA URECHE\* and Dorina V. SZTIKA\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA.
  
- 53 - Morphological consideration concerning the penetration of the multiple renal arteries in the parenchyma. Study on corrosion casts. ZAHOI, D. Delia Elena\*, Petru L. MATUSZ, Dorina V. SZTIKA\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babe\_", Department of Anatomy, Timisoara, ROMANIA.
  
- \*54 - Interactive virtual reality 3D visualization of the circle of Willis using CT angiography. ZURADA\*, Anna, and Jerzy St. GIELECKI\*. Department of Anatomy, Silesian Medical University, POLAND. (sponsored by B.R. MacPherson).
  
- 55 - Handling the gross anatomy teaching faculty shortage and benefiting significantly. MacPHERSON, Brian R., and Don M. GASH. Anatomy and Neurobiology, University of Kentucky, Lexington, KY.

Thursday, June 10<sup>th</sup>

- 56 - Emergency airway access: Dimensions and vascular anatomy of the cricothyroid membrane. LIZAMORE\*, Nanette, Elrie M. MOUTON\*, Johannes M. BOON\*, Johannes H. MEIRING. Department of Anatomy, Section of Clinical Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, SOUTH AFRICA
- 9:00 a.m. **AACA TechFair Session** - Todd R. Olson - Moderator, *Moraga Room, Soda Center.*
- \*9:00 The Cross-sectional Navigator, a new tool for exploring cross sectional anatomy. **ACLAND, Robert D.** The University of Louisville, Louisville, KY.
- 9:10 An interactive, digital model of the thorax, abdomen, and muscles of the upper and lower limbs for use in undergraduate teaching. **AGUR, Anne M. R.**, Shelley L. WALL\*, Stephen G. GILBERT\*, and David MAZIERSKI\*. University of Toronto, Faculty of Medicine, Division of Anatomy, Department of Surgery and Biomedical Communications, Institute of Medical Science, Toronto, ON.
- 9:20 An interactive multimedia tool for use in teaching and learning cranial nerve anatomy. **BRUECKNER, Jennifer K.** and Thomas DOLAN\*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, and the Teaching and Academic Support Center, Lexington KY.
- 9:30 The central nervous system: a multimedia course. **GOULD, Douglas J.** and Jo FLEMING\* Department of Anatomy & Neurobiology, University of Kentucky, Lexington, KY. and ORCCA Technology, Lexington, KY.
- 9:40 Does student use of web-based materials in anatomy improve laboratory and examination preparedness? **GRANGER, Noelle A.**, Diane C. CALLESON\*, and Jennifer M. BURGOON. University of North Carolina School of Medicine, Chapel Hill, NC.
- 9:50-10:20 a.m. **Hands-On Techfair Opportunity and Refreshment Break** - browse the posters

Thursday, June 10<sup>th</sup>

and commercial exhibits - *Claeys Lounge*,  
*Soda Center*.

- 10:20 Integrating anatomical images into a single program. **MALEY, Bruce E.** Department of Anatomy and Neurobiology, University of Kentucky, Lexington, KY.
- 10:30 *The QuickTime VR Anatomical Resource: A library of shared photorealistic virtual specimens.* **NIEDER, Gary L.**, Lynn A. WAGNER\* and Frank NAGY\*. Department of Anatomy and Physiology, Wright State University School of Medicine, Dayton, OH.
- 10:40 A three-dimensional animation program can display anatomic and biomechanical explanations for snapping triceps. **PUNDI, Kavitha\***, Duane A. MORROW\*, Robert J. SPINNER. Mayo Clinic, Depts. of Orthopedics and Neurologic Surgery, Rochester, MN.
- 10:50 The functional anatomy of the Visible Human: Volume I, the head and neck. **SPITZER, Victor M.**, Donald P. JENKINS<sup>1</sup>, David G. WHITLOCK, Gregory M. SPITZER\*, Helen PELSTER\*, Chris LEE\*. Dave RUBINSTEIN\*, Lara REIGLER\*, Patrick SMYTH\*, Richard DOYLE\* and Ann SCHERZINGER\*. Center for Human Simulation, University of Colorado School of Medicine, Aurora, CO, and <sup>1</sup>The National Library of Medicine, Bethesda, MD.
- 11:00 The *Interactive Atlas: an on-line resource for arbitrary oblique, labeled atlas slices from the Visible Human male.* **SPITZER, Gregory M\***, David RUBINSTEIN\*, John DEUTSCH<sup>1\*</sup>, Chris LEE\*, Karl REINIG\*, and Victor SPITZER. Center for Human Simulation, University of Colorado School of Medicine, Aurora, CO, and <sup>1</sup>St. Mary's/Duluth Clinic, Duluth, MN.
- 11:10 A multimedia-based teaching tool for the clinical anatomy of oral local anesthesia. **STEIN, Pamela A\*** and Jennifer K BRUECKNER. Anatomy and Neurobiology, University of Kentucky, Lexington, KY.
- 11:20 Introduction to the cadaver experience: a multimedia program for use in a gross anatomy course. TALARICO<sup>1</sup>,

Thursday, June 10<sup>th</sup>

Ernest F. and **James J. WALKER**<sup>2,3</sup>, <sup>1</sup>Northwest Center for Medical Education and <sup>2</sup>Lafayette Center for Medical Education, Indiana University School of Medicine and <sup>3</sup>Purdue University, IN.

11:30 **Hands-On Techfair Opportunity** – *Lafayette Room, Soda Center.*

12:00-1:30 p.m. **Lunch** - *Oliver Hall*

1:30-2:45 p.m. **Annual Business Meeting** (all members and membership applicants) – *Moraga Room, Soda Center.*

2:45-3:15 p.m. **Refreshment Break** - browse the posters and commercial exhibits - *Claeys Lounge, Soda Center.*

3:15-5:15 p.m. **Educational Affairs Symposium** Moderators – Wojciech Pawlina and Dave Bolender. “How do students learn in medical school?” – Hank B. Slotnick, *Moraga Room, Soda Center*

4:00 p.m. Bus returns from Accompanying Person’s day trip.

6:30 p.m. **Reception** – *Oliver Hall Courtyard.*

7:00 p.m. **Annual AACA Banquet** and presentation of Honored Member Award and the R. Benton Adkins Jr. Distinguished Service Award. – *Oliver Hall*

## Friday, June 11, 2004

7:30-8:30 a.m. **Educational Affairs Committee Breakfast**, “*Breakfast with the Experts*” – *Dryden Hall*

7:30-8:30 a.m. **Breakfast** – *Oliver Hall*

Friday, June 11<sup>th</sup>

- 7:30-8:30 a.m. **Registration/Check-in** – *Conference Desk, Soda Center Foyer.*
- 8:30-9:30 a.m. **New Concepts in Anatomy.** Dr. Gerald D. Buckberg “The Helical Heart” – *Moraga Room, Soda Center.*
- 9:30-9:45 **Refreshment Break** – *Claeys Lounge, Soda Center*
- 9:45-12:30 p.m. **Anatomical Services Committee Symposium,** “Donor program management: legal, financial and operational considerations” – *Moraga Room, Soda Center.*
- 12:30 p.m. **Adjournment**
- 12:30-1:30 **Lunch** – *Oliver Hall*
- 12:30-1:30 **AACA New Council Lunch Meeting** – *Founders’ Dining Room*
- 1:30 p.m. **Golf Outing** - *Tilden Park Golf Course.*

## Saturday, June 12, 2004

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

The logo for UCSF, consisting of the letters 'UCSF' in a bold, sans-serif font.

**21<sup>st</sup> Annual Meeting Postgraduate Course**

***Pelvic/Perineal Anatomy and the Urogenital System***

Saturday, June 12<sup>th</sup>

All events at University of California, San Francisco.

- 7:30 a.m. Bus departs St. Mary's College for University of California at San Francisco.
- 8:30-9:00 a.m. Continental Breakfast – *Faculty Alumni House*
- 9:00-9:10 a.m. Opening Remarks - *Toland Hall, 533 Parnassus Ave., Room U-142.*
- 9:15-11:45 a.m. Lectures/Presentations (with a refreshment break)
- 11:45-12:00 Walk to lunch
- 12:00-1:15 p.m. Lunch – *Faculty Alumni House*
- 1:15-1:30 p.m. Walk to anatomy lab
- 1:30-3:30 p.m. Hands-on rotations – in anatomy lab (with a refreshment break), *513 Parnassus Ave., 13th Floor, Room S1320.*
- 3:30 p.m. Depart for return to St. Mary's College

**Course Description and Objectives**

An area of great clinical interest, accounting for a lion's share of annual office visits and inpatient care, the pelvis/perineum is traditionally one of the most difficult areas for health professionals in training (students, interns, residents), as well as one of the most challenging areas for faculty to teach effectively. Pelvic/perineal anatomy within the normal range is prerequisite for preservation of the species. Because it includes critical portions of the reproductive, digestive, urinary, and musculoskeletal systems, abnormalities and malfunctions resulting from alteration of the normal structure by trauma or disease have a devastating impact. Over the last two decades, concepts of the anatomy of this region maintained for centuries have undergone considerable revision. Traditional views have been modified or replaced by new understandings, gained in large part from the study of living anatomy afforded by modern medical imaging.

**Saturday, June 12<sup>th</sup>**

In this course an emphasis will be placed on information and concepts useful in teaching health professionals in training, stressing their clinical application. The course is presented by faculty with a special interest in the pelvis and perineum, experienced in teaching, clinical practice, and/or research, with substantial records of publication in the field.

Upon completion of the course, the participants will have an updated knowledge of the clinical anatomy of the pelvis and perineum, and be able to:

- appreciate why traditional views have been replaced with new insights
- understand the new terminology (nomenclature) applied in the region—an area where the lack of consistent and uniform terminology has been especially problematic
- 
- appreciate which aspects of pelvic/perineal anatomy are especially relevant to current clinical practice, such as the anatomical basis for problems of pelvic floor dysfunction including pelvic organ prolapse and excretory incontinence.
- gain new insights into the presentation of pelvic/perineal anatomy in the classroom and laboratory.
- 

Presentation handouts and take home materials will be provided.

Program Faculty:

**Arthur F. Dalley, II, Ph.D.**

Professor, Dept of Cell and Developmental Biology

Director, Medical Gross Anatomy

Vanderbilt University School of Medicine

## ABSTRACTS

ABRAHAMS<sup>1</sup>, Peter H., Albert-N. VAN SCHOOR<sup>2</sup> \*, Johannes M. BOON<sup>2</sup> \*, Adrian T. BOSENBERG<sup>3</sup> \*, Johannes H. MEIRING<sup>2</sup>. <sup>1</sup> Kigezi International School of Medicine, Cambridge, Girton College, Cambridge, United Kingdom, St George's University Grenada and St Vincent, West Indies. <sup>2</sup> Department of Anatomy, Section of Clinical Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, South Africa. <sup>3</sup> Department of Anaesthesia, Faculty of Health Sciences, University of Cape Town, South Africa. Anatomical considerations of the pediatric ilioinguinal/iliohypogastric nerve block. The ilioinguinal/iliohypogastric nerve block is a technique that is an effective procedure that provides analgesia for a variety of inguinal surgical procedures in children. However, a relatively high failure rate of 10-25% has been reported. The aim of this study was to determine the exact anatomical position of the ilioinguinal and iliohypogastric nerves in relation to an easily identifiable bony landmark, the anterior superior iliac spine (ASIS), in neonates. Dissections were performed on a sample of 25 neonatal cadavers (mean weight=2.2kg; mean height=45.6cm) and the distance from the ASIS to both these nerves, on a line connecting the ipsilateral ASIS to the umbilicus was measured using a digital calliper. The nerves were found to be much closer to the ASIS than was previously thought. We suggest that the high failure rate of the ilioinguinal/iliohypogastric nerve block could be due to lack of spatial knowledge regarding the anatomy of these nerves in neonates. This cadaver-based study suggests an insertion point closer to the ASIS, approximately 2.5mm (range between 1.0mm-4.9mm) from the ASIS on a line drawn between the ASIS and the umbilicus. Our findings have been successfully applied to a small clinical series of 10 neonates undergoing inguinal herniotomy.

ACLAND, Robert D., The University of Louisville, Louisville, KY. The Cross-sectional Navigator, a new tool for exploring cross sectional anatomy.

The Cross-sectional Navigator is a cross-platform Authorware program designed to give students and teachers a new way to explore cross-sectional anatomy. It presents sequences of images from the High Resolution series of the Visible Male and Female datasets, published by the National Library of Medicine in 2000 and 2004. The image sequences are selected to show the areas of the body of chief interest to medical, dental and allied health students. The images are presented in an 800 x 600 pixel window that includes a small area for controls. The user can move up or down through an image sequence in steps of one, 10 or 100 levels at a

## Abstracts

time. The up and down commands can be activated by on screen buttons, or by keyboard commands. The change from one image to the next is instantaneous. The user can turn on captions and/or leader lines that identify principal structures. A small side image shows a sagittal view of the specimen, with a moving horizontal line that moves up and down to indicate the level of the slice currently being viewed. The Cross-sectional Navigator is presented as a work in progress, for member information and critique.

AGUR, Anne, Fateme SALEHI\*, and Philip ROBINSON\*. Division of Anatomy, Department of Surgery, Faculty of Medicine, University of Toronto, Toronto, Ontario, CANADA, and Department of Radiology, St James University Hospital, Leeds, UNITED KINGDOM. Attachment of adductors to the pubic symphysis: a consideration in the diagnosis of groin pain in athletes.

Magnetic resonance imaging of professional athletes has shown a correlation between adductor longus entheses abnormalities and athletes' symptoms, but the complex anatomy of this region is poorly understood. Therefore, the aim of this study was to investigate the proximal attachment sites of the adductor muscles (longus (AL), brevis (AB), magnus (AM)) and gracilis (G). Fifteen cadaveric specimens (mean age 83 years; 8 male / 7 female) were dissected bilaterally. Of these, 12 were embalmed and 3 were fresh specimens. Muscular and tendinous portions of the muscles were traced meticulously to their proximal attachments, including the pubic symphysis (PS). In females, the superficial tendinous fibers and the deep muscular fibers of AL attached to the fibrous tissue overlying the interpubic disc (FT). In 90% of males, only the deep muscular fibers attached to the FT. Further, in 45% of males and 60% of females, superficial tendinous fibers of AB attached to the FT. G was found to attach to the FT in one specimen; AM did not attach to the PS. The attachment of adductor muscles to the PS has not been previously studied, but the findings of this study suggest it may be a factor in groin pain in athletes.

AGUR, Anne M. R., Shelley L. WALL\*, Stephen G. GILBERT\*, and David MAZIERSKI\*. University of Toronto, Faculty of Medicine, Division of Anatomy, Department of Surgery and Biomedical Communications, Institute of Medical Science, Toronto, ON. An interactive, digital model of the thorax, abdomen, and muscles of the upper and lower limbs for use in undergraduate teaching.

An interactive, web-based teaching module for projection during lectures and for student use in the anatomy computer lab has been

## Abstracts

developed by graduate students\*\* and faculty in the MSc BMC program. Hand-drawn illustrations of the skeleton, major organ systems, and muscles of the upper and lower limbs were created. All structures were drawn to scale, so that they could be placed in relation to the skeletal framework. The pen-and-ink illustrations, digitized and rendered in Adobe Photoshop, form the basis for the Flash MX program. Within this “layered” digital body, organ systems in the thorax and abdomen can be displayed individually or in combination, and shown in relation to vertebral level. The bones and muscles of the upper and lower limbs can be viewed individually or in groups. The program is designed so that functions such as labelling, layering, grouping, and ordering are highly flexible, but the interface remains simple and straightforward to use. Revisions are made in response to student and expert feedback. This program is an in-house project of the Division of Anatomy and is not commercially produced or distributed. \*\*Danielle Bader, Andrea Berenbaum, Andrea Cormier, Ayalah Hutchins, Doris Leung, Michelle Lui, Elisheva Marcus, Camillia Matuk, Katie McCormack, Jennifer Platt, Jason Raine, Julie Saunders, Gloria Situ, Shelley Wall, Janice Wong, and Winnie Yu.

ANDREADIS, Athena\*, Bina VORA\*, and Marios LOUKAS. Department of Anatomy, American University of the Caribbean. Students emotions and reaction to cadaver dissection.

Experience by first year medical students at the American University of the Caribbean on the occasion of their first exposure to cadaver dissection has revealed that a proportion of students are influenced negatively with respect to feelings and attitudes, ranging from fear to discomfort to moderate insecurity. Such a potential emotional distress may result in destabilization of medical studies. The qualitative responses of students on their initiation to the cadaver experience have been undertaken in an exploratory questionnaire. A total of 169 (84.5%) students in their first year of medical studies at our university participated in the study. The question regarding students' responses to the first visual exposure to the cadaver yielded 3% of respondents who reported feelings of extreme stress, 7.7% reported feelings of moderate stress, 24.9% a little bit of stress and 59.8% reported no stress as their first reaction. It was found that 82.8% of the medical students surveyed have had prior experience in a clinical setting. The survey also revealed 85% of students have been exposed to a deceased human body in the past. Although 83.9% of students indicated that they had dedicated intellectual thought to the idea of working with a cadaver as opposed to a

## Abstracts

simulated anatomical experience, only 24.3% of students indicated that their decision to attend this medical university was swayed by the fact. Interestingly it was indicated by 74% of students that they would donate their body organs for transplantation purposes, but only 27.2% would be willing to donate their bodies to medical universities for educational use. Despite our findings that 92.9% of students did not feel there was a negative effect on their performance in class, 16% indicated that they would still like some type of orientation to “feel better” prepared to handle the cadavers. 26% responded that a better way to aid in the adjustment of students to the cadaver anatomy lab would be to offer discussion sessions regarding death and dying. The results of the survey may give rise to a more adapted program that allows for issues of cadaver anxiety to be dealt with in an effective manner.

ARORA, Shagun<sup>1\*</sup> and Marios LOUKAS<sup>1,2</sup>. Department of Anatomy, American University of the Caribbean, Harvard Medical School. The anatomy of the right and left atrial appendage.

Transesophageal echocardiography (TEE) is the diagnostic modality of choice for visualizing the left and right atrial appendage (LAA) (RAA). The aim of this study was to define the morphology of the LAA & RAA in adult human hearts and considered the implications of these findings for TEE studies. Five hundred formalin fixed hearts were examined. LAA & RAA length, width, orifice size, and number of lobes were recorded. According to the morphology of pectinate muscles the LAA & RAA were divided into different lobes. The number of lobes was compared between the different sexes and age, and between RAA & LAA. Mean length, width, and orifice size increased with age, up to age 20 years, in both sexes. 20% of LAAs had one lobe and 50%, 20% and 10% of the remaining hearts possessed 2,3 and 4 lobes respectively. 70% of RAAs had one lobe and 10%, 10% and 10% of the remaining hearts possessed 2,3 and 4 lobes respectively. Most pectinate muscles were 1 mm in width in LAA while in RAA can range up to 5 mm. Pectinate muscles <1 mm (2.6% of cases) were seen in either very old or very young hearts. Age- and sex-related differences in LAA and RAA dimensions exist. These differences and the existence of multilobed appendages are important in the accurate TEE evaluation of LAA and RAA. This information could be very important for the understanding of atrial thrombus formation.

## Abstracts

BODILY\*, Kale D., Robert J. SPINNER, Alexander Y. SHIN\*, Allen T. BISHOP\*. Mayo Clinic, Department of Orthopedics, Rochester, MN. The clinical significance of suprascapular nerve mobilization.

The anatomy of the suprascapular nerve (namely its somewhat redundant course) is important to surgeons when focal nerve lesions necessitate surgical repair. We present clinical and anatomic evidence to illustrate that a successful direct nerve repair of the suprascapular nerve is indeed possible by mobilization of the nerve and release of the superior transverse scapular ligament, despite resection of a neuroma. This technique has not been previously emphasized for suprascapular nerve repairs. We present a patient who had a brachial plexus injury following a motorcycle accident. He sustained a clavicle fracture and was found to have complete loss of shoulder abduction. When he did not show clinical recovery, surgical exploration was accomplished. A suprascapular nerve neuroma in continuity (as well as an axillary nerve rupture) were identified retroclavicularly. Mobilization of the nerve and release of the superior transverse scapular ligament provided necessary length to achieve a tensionless direct repair of the proximal and distal stumps of the suprascapular nerve. An interpositional sural nerve graft was performed to the axillary nerve. This method of nerve mobilization of the suprascapular nerve was then studied quantitatively in four fresh specimens (two cadavers). Four months postoperatively, this patient demonstrated early evidence of electrical and clinical reinnervation in the supraspinatus muscle. At nine months, he had regained > 90 degrees of abduction (supraspinatus and deltoid) and >60 degrees of external rotation (infraspinatus). By 15 months, he had regained nearly complete function against resistance. Cadaveric dissections demonstrated that mobilization of the nerve and release of the superior transverse scapular ligament generated an average of 1.6 cm and 0.7 cm of extra length respectively, totaling 2.3 cm of extra usable length overall. Clinical outcomes following direct end-to-end nerve repair are far superior to those obtained with interpositional grafting, mostly due to the fact that there is only a single suture line for regenerating axons to cross. Shortening nerve gaps to facilitate nerve repair is a fundamental principle of peripheral nerve surgery, leading surgeons to employ techniques including mobilization or transposition, whenever possible, or even joint positioning, bone shortening or nerve elongation. The clinical significance of this anatomic finding in the suprascapular nerve is evident in our ability to achieve a direct nerve repair and achieve such an excellent clinical outcome. Interpositional grafting of the suprascapular nerve seldom produces this degree and strength of abduction (especially when

## Abstracts

combined with an axillary nerve lesion), or external rotation in the more distally innervated infraspinatus muscle. We conclude that mobilization of the suprascapular nerve and release of the superior transverse scapular ligament can decrease a nerve gap, allowing surgeons the benefit of accomplishing direct nerve repairs in the setting of focal nerve lesions. This technique maximizes the chance of obtaining favorable functional outcomes.

BRUECKNER, Jennifer K and Thomas DOLAN\*. University of Kentucky College of Medicine, Department of Anatomy and Neurobiology, and the Teaching and Academic Support Center, Lexington KY. An interactive multimedia tool for use in teaching and learning cranial nerve anatomy.

The mastery of cranial nerve anatomy is challenging for many first year health science students. The complex three-dimensional course of the cranial nerves through the head and neck is difficult to envision from diagrams in a book or lecture notes. To encourage a more active and effective approach to learning cranial nerve anatomy and function, we are developing a multimedia tutorial using Macromedia Director 8.5 and Flash 5. The program consists of a didactic component outlining each nerve's distribution and constituent fiber types. Each modality can be studied individually or as a part of the nerve as a whole. Lesion exercises demonstrate key regions along each nerve that produce distinct functional consequences when compromised. Weak areas of comprehension are quickly identified in the nerve lesion exercises and can be remedied quickly by accessing hyperlinks to relevant tutorial modules. In addition, clinical case studies facilitate clinical application of cranial nerve anatomy and function. This flexible, customized approach to the study of cranial nerve anatomy is designed to promote active learning and facilitate student mastery of the subject matter. This software promotes more efficient study habits, better comprehension of the subject matter and improved preparation for examinations in gross anatomy and neuroanatomy.

BUCKBERG, Gerald, D. Department of Cardiac Surgery, David Geffen School of Medicine, University of California, Los Angeles, CA. The helical heart.

A macroscopic structure of an elliptical heart, formed by the helix provided by the apical loop is defined and related, initially, to normal function. Concepts of embryologic background will be discussed. This novel format of structure for the helical heart is then compared to the historical background studies of ventricular structure defining

## Abstracts

an evolutionary process that has uncovered the ventricular helix that is responsible for left ventricular filling and emptying. New concepts will show how the basal loops cause initial isovolumetric contraction, together with factors responsible for ventricular lengthening responsible for filling by suction. The interaction of these muscular/functional changes are correlated to basic studies of electro physiology (excitation/contraction) to set the stage for alterations produced by changing the helical apex to a sphere during congestive heart failure. A unified geometric concept of ischemic, idiopathic, and dilated ventricular will be presented, based upon architectural change from the conical normal shape into a spherical cardiac form as the underpinning of dilated cardiomyopathy. It is our hypothesis that the commonality of this spherical LV substrate becomes responsible for Functional components of underlying anatomic changes to a sphere are correlated with events in cardiac failure. These anatomic underpinnings of function/structure will become the basis for evolution of innovative surgical treatment of heart failure (with an abnormal spherical architecture) that is directed at rebuilding and restoring the natural ellipse shape.

BURGOON, Jennifer M., Diane C. CALLESON\*, and Noelle A. GRANGER. University of North Carolina School of Medicine, Chapel Hill, NC. Does medical student self-efficacy for the human anatomy curriculum continue to increase after the beginning weeks of coursework?

Anatomy instructors should be concerned with the self-efficacy of their students, as student judgments about their own abilities to successfully complete tasks has been shown to impact academic achievement, persistence, and choice of activities. Within the context of the medical anatomy curriculum, we define perceived anatomical self-efficacy as a student's judgment of his or her ability and skills to successfully complete dissections, learn anatomical knowledge, and apply anatomical knowledge to clinical situations. Through an ongoing collection of student surveys during a first year human anatomy course at a public medical school, medical student self-efficacy for the anatomy curriculum is being investigated. Results from the first year of data collection (Year 1; n=129) indicated that anatomical self-efficacy of medical students generally increases during the first three weeks of the course. A second year of data collection (Year 2; n=126) was undertaken to look at the potential changes in medical student self-efficacy for the anatomy curriculum after six weeks of the course. The same magnitude of increase in anatomical self-efficacy was observed in Year 2 as in

## Abstracts

Year 1, although the course content and time between the data collection points was increased for Year 2. These results suggest that the first few weeks of the gross anatomy course are critical for increasing medical student self-efficacy for the anatomy curriculum. [Sponsored by Grant No. P116B010181 from the Fund for the Improvement of Postsecondary Education (FIPSE), US Department of Education.]

CHHAYA\*, Sam A., Lawrence WHITE\*, and Anne M.R. AGUR. Department of Medical Imaging, Mount Sinai and University Health Network and Division of Anatomy, Department of Surgery, University of Toronto, ON, Canada. Transarticular invasion of bone tumours across the sacroiliac joint.

The sacroiliac joint (SIJ) is the most common joint invaded by tumour. Assessment of transarticular invasion across the joint is important when determining the extent of surgical resection. The pattern of transarticular invasion by pelvic bone tumours was studied and correlated with anatomic observations in cadaveric specimens. Twenty-four patients (14 male, 14 female) with pelvic bone tumours (22 to 89 years) underwent cross-sectional imaging with either CT or MRI prior to surgical resection and histological examination. Seven cadaveric specimens with a mean age of 71 years (3 male, 4 female) were dissected and examined macroscopically. Twelve of the twenty-four patients demonstrated imaging and histological evidence of transarticular SIJ invasion. Eight tumours infiltrated the posterior interosseous part of the joint. Four cases infiltrated the anterior synovial and posterior interosseous parts of the joint. No case infiltrated only the anterior part of the joint. Cadaveric examination demonstrated extensive ossification of the interosseous portion of all the joints studied. We conclude that tumour invasion across the SIJ favours the interosseous ligamentous portion. Limited mobility across the joint, close apposition of the sacrum and ilium, and the interosseous ligaments are all factors contributing to tumour spread. We demonstrate interosseous ligament ossification which we believe is a further factor in allowing tumour spread across the SIJ.

COLLINS, James D., Ernestina H. SAXTON\*, Samuel S. AHN\*, Theodore Q. MILLER\*, Alfred CARNES\*. Departments of Neurology, Radiological Sciences, and Vascular Surgery, UCLA School of Medicine, Los Angeles, CA. Bilateral MRI, MRA AND MRV displays venous compression and collateral drainage from vascular compression in thoracic outlet syndrome (TOS) and migraine patients.

## Abstracts

Magnetic resonance imaging (MRI) displays nerves, arteries, veins, lymphatics and landmark anatomy within fascial planes according to proton density. Peripheral nerves are supplied by nutrient arteries, draining veins, and lymphatics (Clin. Anat. 1995; 8:1-16). Bicuspid valves within veins and lymphatics direct, assist, and divert pressure to return blood and lymph to the circulatory system. Impedance to venous return proximally dilates veins and lymphatics which expands fascia impeding arterial flow. Clinically, patients present with dilated veins over the face, neck, supraclavicular fossae, chest walls and extremities. Bilateral MRI, MRA and MRV (magnetic resonance angiography and venography) display costoclavicular vascular compression, collateral venous drainage, and at the same time triggers patients' complaints of increase head pressure; blurred vision and floaters, ear fullness and tinnitus; tingling and numbness, and radiating pain over the neck, shoulders, chest wall and extremities. Multiplanar MRI MRA and MRV images of thirty patients were obtained on a 1.5 Tesla G.E. Signa LX unit. Collateral venous return was greater on the side of greater venous obstruction. This presentation displays collateral venous drainage in patients with silicone scarring, breast carcinoma, shoulder muscle laxity, and post-bilateral first rib resection scalenectomy with cervical spine fusion.

DOBBS\*, Ryan, Timothy P. McVANEY\*, Laura C. BARRITT, and Neil S. NORTON. Departments of Oral Biology and Oral Surgery, School of Dentistry, Creighton University, Omaha, NE.

### The use of fresh tissue cadavers to examine the distribution of India ink in a Maxillary division nerve block.

The Maxillary nerve block is a very useful way to achieve anesthesia of the Maxillary division of the Trigeminal nerve. If properly administered, it will provide pulpal anesthesia to the maxillary teeth from the central incisor to the third molar, including all buccal and palatal gingiva. This block targets the maxillary nerve and its branches in the pterygopalatine fossa. We sought to examine the distribution of the anesthetic using fresh tissue cadavers. In our study, a 25 gauge needle was placed in the greater palatine foramen and advanced superiorly in the direction of the pterygopalatine fossa. A 1.8 ml carpule containing 10% India ink was then injected into the pterygopalatine fossa. Dissections were performed to determine the dispersion of the ink in the tissue. Digital images were recorded of the pterygopalatine fossa from the medial aspect and infratemporal fossa from the lateral aspect to trace the spread of the ink. We observed that the India ink would fill the entire pterygopalatine fossa

## Abstracts

enveloping all of the contents, including the branches of the maxillary division and the third part of the maxillary artery.

DOWNIE<sup>1,2</sup>, Sherry A., Daniel S. FINK<sup>\*3</sup>, Michael P. JONES<sup>\*3</sup>, Noemi RIGOL<sup>\*3</sup>, Eliyahu C. ROSMAN<sup>\*3</sup>, Todd R. OLSON<sup>1</sup>.

<sup>1</sup>Department of Anatomy and Structural Biology, Albert Einstein College of Medicine, Bronx, NY. <sup>2</sup>Division of Natural Sciences, Mercy College, Dobbs Ferry, NY. <sup>3</sup>Class of 2007, Albert Einstein College of Medicine, Bronx, NY, USA. Multiple bilateral anomalies of the brachial plexus and axillary artery: a cadaver dissection case.

Brachial plexus and axillary artery anomalies, together with a panoply of other neurovascular and muscular variations, were observed during dissection of a 68-year-old male cadaver. Bilaterally, the axillary artery passed anterior and inferior to all trunks, divisions and cords of the plexus. Normal neurovascular relationships were only established just proximal to axillary artery termination. The RIGHT plexus was unique in having a single axillary cord. C5-T1 rami, associated trunks, and their posterior divisions arose and joined normally to form a posterior cord. The anterior divisions of the middle and inferior trunks merged for 0.5 cm before joining with the anterior division of the superior trunk to form an atypical anterior cord. After producing the two medial cutaneous nerves, this atypical anterior cord joined the posterior cord to form a short axillary cord. The axillary cord immediately split into anterior and posterior bundles that gave rise to all major terminal branches typically derived from medial, lateral and posterior cords. A similar condition was described unilaterally by E. Singer in 1933 (*Anat. Rec.* 55:411-419) in which the trunks failed to divide and instead coalesced directly into one cord. The LEFT plexus differed significantly in having only two trunks. A normal superior trunk formed from C5-C6 rami while the inferior trunk was formed abnormally from the rami of C7-T1. The confluence of C7-T1 was not coincident. C8-T1 combined first then joined the C7 ramus to form a definitive inferior trunk. The superior trunk divided unevenly. The small posterior division produced the suprascapular nerve before joining the inferior trunk to form a true posterior cord. The large anterior division of the superior trunk coalesced with a small anterior division from the posterior cord to create an anterior cord with five nerve branches: medial cutaneous, ulnar, medial and lateral roots of the median nerve, and musculocutaneous. The posterior cord, largely a direct continuation of the inferior trunk, split into upper subscapular, thoracodorsal, radial and axillary nerves. The lower subscapular nerve arose from the axillary. Over the

## Abstracts

extent of the left brachial plexus, there were always two distinct trunks, two divisions and two cords located posterior to the axillary artery. Singer speculated that the fused brachial plexus he observed was caused by abnormal growth of the axillary artery. Aizawa *et al.* (*Anat. Embryol.* 200:573-584, 1999) observed that the initial formation of the axillary artery and plexus are independent. The existence of the classic "M" pattern at the origin of both the right and left median nerves in our dissection, absent a piercing axillary artery, further supports the conclusion that the details of the plexus branching pattern are established independently of arterial formation. These findings are also relevant in the clinical setting with respect to axillary nerve blocks and surgical procedures in the axilla.

ESMAEILI<sup>1</sup>, Ehsan\*, Theodoros KAPO<sup>2\*</sup>, Mariusz WRZOSEK<sup>2\*</sup>, and Marios LOUKAS<sup>1,3</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, <sup>2</sup>Harvard School of Dental Medicine, <sup>3</sup>Harvard Medical School. The clinical anatomy of the auriculo-temporal nerve.

Anatomic and clinical reports reveal a relationship of the auriculotemporal nerve (ATN) to the condyle, articular fossa, and lateral pterygoid muscle. This may be the causative factor related to compression or irritation of the nerve, producing numbness or pain, or both, in the TMJ region. The aim of the study was to define the topography of the ATN in relation to the mandibular condyle, capsular tissues, articular fossa, and lateral pterygoid muscle and to evaluate the anatomic possibility of nerve impingement or irritation by the surrounding structures. Furthermore, to establish the optimal locations for anesthetic nerve blocks, as well as to help surgeons prevent nerve injuries. 100 formalin fixed cadavers were examined. It was possible to identify 8 different branching types of ATN in relationship to middle meningeal artery at the infratemporal fossa. The ATN was identified on each side, and a single trunk was evident along the medial aspect of the condylar neck. At the posterior border of the lateral pterygoid muscle, the nerve trunk was in direct contact with the condylar neck in every specimen. The mean vertical distance between the superior condyle and the nerve was 6.56 mm. The vertical distance between the nerve and the superior condyle on one side of the specimen did not correlate with the distance on the contralateral side. The ATN is best blocked at a point located at the level with and 10-15 mm (range 7.2-26.2 mm) anterior to the upper origin of the helix. The variability of the ATN and its peripheral branching suggests several methods for anesthetic blocks in cases of surgical and clinical TMJ pain.

## Abstracts

ESMAEILI<sup>1</sup>, Ehsan\*, Theodoros KAPO<sup>2\*</sup>, Mariusz WRZOSEK<sup>2\*</sup>, and Marios LOUKAS.<sup>1,2</sup> <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard School of Dental Medicine, <sup>3</sup>Harvard Medical School, Boston, MA. The anatomy of the maxillary artery with special emphasis to pterygopalatine artery.

The pterygopalatine branch of the internal maxillary artery has variable branching pattern in the pterygopalatine fossa. This variability in branching can lead to failure in controlling persistent nasal epistaxis by transantral ligation. Although the surgical approach has been previously studied, a systematic anatomic classification and description of the branching pattern has become necessary. The purpose of this study therefore, was to delineate the anatomy of the third part of the maxillary artery and its branching arteries and to develop a classification system. We dissected 100 adult human formalin fixed cadavers. From the pterygomaxillary junction to the pterygopalatine fossa region, the maxillary artery was usually branched into 5 arteries in the following order: posterior superior alveolar artery, infraorbital artery, artery of the pterygoid canal, descending palatine artery, and sphenopalatine artery. The third portion of the maxillary artery was classified into 5 types according to the branching pattern of the aforementioned arteries: Type I (33%), Type II (20%), Type III (18%), Type IV (16%) and Type V (13%). The average distance from the most inferior point of the pterygomaxillary junction to the posterosuperior alveolar artery, infraorbital artery, and descending palatine artery was 19.5, 38.3, and 21.6 mm, respectively. In most cases (88%), the greater and lesser palatine arteries were divided from the short descending palatine artery.

FITZSIMMONS<sup>1</sup>, John M., Bina VORA<sup>2</sup>, and Marios LOUKAS<sup>1,2</sup>. Department of Radiology, <sup>1</sup>Michigan State University, MI and <sup>2</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten NA. Student responses to the cadaver lab.

The gross anatomy course for first year medical students is a course that may cause great anxiety, not only because of the vast content of the course, but also simply because it may be the first time many of these students are encountering a dead human body. Some reports suggest that there is a strong negative response to the cadaver lab experience. We have chosen to assess this phenomena ourselves at Michigan State University by administering a survey to our first year medical students at the beginning of their lab experience and then again at the end. The intent is to determine if there are

## Abstracts

negative emotional and/or physical responses to the lab and if there is improvement in these responses during the course. Our data suggest that the majority of students view the cadaver lab in a very intellectual manner and are not traumatized by the experience. However, there is a small subset of students for whom the cadaver lab is initially a traumatic experience. We offer explanations for our findings, differences compared to other studies and what might be done by the faculty, if anything, to make the cadaver lab a more positive experience for all students.

FOGG, Quentin A., and Ian L. GIBBINS\*. Department of Anatomy and Histology, Flinders University, Adelaide, AUSTRALIA. Functional anatomy classes for science students designed to facilitate application of knowledge and develop professional scientific skills.

The introductory anatomy taught to science students has often mirrored that taught to medical students, despite the differing objectives of the courses. A method for more appropriate teaching of these students has been developed. The first aim of the design is to facilitate learning and application of anatomical knowledge. Topics are carefully sequenced so that earlier classes form the foundation for later ones, and focus on functional design rather than intricate detail. The second aim is to aid the development of professional skills such as interpretation of data, report/paper writing and poster/oral presentation. Written skills and data interpretation are tested as students are asked to critically review and interpret the results of a key paper for each area of the course. Multiple reviews enable the students to receive large amounts of feedback and to enhance their skills as the course continues. A poster presentation allows verbal skills to be tested and the ability to communicate their understanding to others. The aim of this course is therefore the development of graduates with not only better anatomical knowledge, but with better communication and research skills.

FOGG, Quentin A.<sup>1,3</sup>, Gregory I. BAIN\*<sup>2</sup>, and Raymond A. TEDMAN\*<sup>3</sup>. <sup>1</sup>Department of Anatomy and Histology, Flinders University, Adelaide, Australia; <sup>2</sup>Modbury Public Hospital, Adelaide, Australia; <sup>3</sup>Department of Anatomical Sciences, the University of Adelaide, Adelaide, AUSTRALIA. Histologic differentiation of macroscopically indistinct tissues: ligament and joint capsule of the wrist.

The complex anatomy of the wrist is poorly understood. Macroscopic differentiation between ligament and joint capsule is difficult, making gross descriptions of ligamentous support unreliable. Histologic staining of the wrist permits tissue types to be differentiated. The

## Abstracts

relationship of each tissue to bone may indicate the function of the tissue. Embalmed Specimens were processed (n = 30) and 15mm sections were cut using a sliding microtome. Sections were stained with a modified Masson's Trichrome stain to differentiate joint capsule and ligament. Digital images of ligamentous and capsular attachments were taken around the perimeter of each bone. Measurements of attachment length, bone perimeter and bone area were made using Image J analysis software. Histologic examination permitted differentiation of ligament and joint capsule. Once differentiated the bone to which they were attached was measured. Enthesial bone had significantly ( $p < 0.05$ ) greater mean area than capsular bone. There was significantly ( $p < 0.05$ ) more enthesial bone in the wrist than capsular bone. The bone to which various tissues are attached in the wrist may indicate the force bearing capabilities of the tissue. The difference in bone area supports the differentiation of the soft tissues. This may help improve anatomical and functional understanding of the wrist.

GASPARD<sup>1</sup>, Josh\* and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard Medical School, Boston, MA. Retroesophageal and retrotracheal subclavian arteries.

The retroesophageal right subclavian artery (RRSA) is an anatomical abnormality encountered by anatomists and pathologists and recently interventional cardiologists and thoracic surgeons with an incidence 0.2-2% in the population. We report 10 cases of a RRSA arising from a normally located left aortic arches and one unique case of retrotracheal right subclavian artery. The right subclavian artery coursed posterior to the esophagus, thus allowing it to be more accurately described as a RRSA or arteria lusoria. The retrotracheal right subclavian artery coursed in between the trachea and the esophagus. In addition to the aforementioned anomalies, we examined in all specimens the presence of a right recurrent inferior laryngeal nerve and we found out that in 5 of the specimens the nerve did not recur. The possible embryonic development of these branching patterns and their clinical significance is discussed. The RRSA is also clinically important to the angiographer who uses the right axillary, brachial or radial approach to the ascending thoracic aorta. The presence of a RRSA is suspected in cases in which catheterization of the ascending aorta proves difficult. Using the right radial approach, access to the ascending aorta is usually easy, as the brachiocephalic trunk is the first branch of the aortic arch permitting direct access to the ascending aorta. Thus, in the

## Abstracts

presence of RRSA angiography could be very challenging. Finally, the inferior right recurrent laryngeal nerve is an asymptomatic variation-anomaly, which can be an important obstacle and be seriously damaged during cervicotomy, thyroid and parathyroid surgery.

GIELECKI\*, Jerzy St., and Anna URADA\*. Department of Anatomy, Silesian Medical University, POLAND. (sponsored by B. R. MacPherson). Clinical and diagnostic implications of the fetal basilar artery morphology. The study was performed on 134 human fetuses, aged from 12 to 40 weeks. Original Angioanalyser 4.0 software has been used for the quantitative description of the basilar artery (BA) development. The BA volume exhibits regular exponential growth showing statistically significant differences between all four week periods. The dynamics of the volume growth of the BA is similar to the exponential growth of the brain mass (BM). It was found asynchronous development of the BM and the volume of the BA. The index of the BA supply decreases during the development from the level of 0.2 at 12 weeks of gestation to 0.07 at the end of the intrauterine development. It was indicated that there were statistically significant differences in the length, average diameter and volume of BA between all examined periods. Nevertheless, the comparison of dynamics in the development of the BA, show changes in relations of the length and its diameter. At the end of the intrauterine life, the dynamics of development of the length is smaller than the dynamics of the average diameter. The BA has a greater significance in the beginning of intrauterine life and lessens its significance as development of the brain continues.

GOLDIE, Stephen J., Richard THOMPSON\*, David SOUTAR\*, John SHAW-DUNN\*. Department of Human Anatomy, University of Glasgow, and Canniesburn Plastic Surgery Unit, Glasgow Royal Infirmary, Glasgow, UNITED KINGDOM. Arterial supply of the DCIA flap.

The deep circumflex iliac artery (DCIA) flap's main constituents are a rim of iliac crest and an overlying paddle of skin. Taylor et al, believed that both constituents were supplied by the DCIA, but in some recent DCIA flaps the bone has survived while the skin has undergone necrosis, suggesting they have different arterial supplies. To test this hypothesis, three DCIA flaps, with both the deep and superficial circumflex iliac arteries (SCIA), were raised from three unembalmed cadavers. The DCIA pedicle was injected with a mass of black latex, while the SCIA was injected with a mass of green

## Abstracts

latex. The flaps were rendered transparent using the Spalteholz method. In each flap, black latex filled vessels close to the rim of bone. Green latex filled vessels in the skin paddle. No black latex was seen in the skin paddle, nor was green latex seen in the bone segment. There was no apparent anastomosis between the two systems. The DCIA mainly supplies the bone and the SCIA the skin, but the DCIA is not adequate to supply both. When raising a flap of bone and skin from the iliac crest region, surgeons should raise both the deep and superficial circumflex arteries.

GOULD, Douglas J. and Jo FLEMING\* Department of Anatomy & Neurobiology, University of Kentucky, Lexington, KY. and ORCCA Technology, Lexington, KY. The central nervous system: A multimedia course.

The objective of the current project is to create and evaluate the first phase of a multimedia software package that provides an interactive programmed-learning experience covering the structural and functional interrelationships of the CNS using an approach that emphasizes nervous system interconnectivity. Users can follow lesson-plans through a topic using a programmed, linearly-arranged set of modules. The use of multimedia technologies, which include 3-D modeling, Quick Time Virtual Reality (QTVR) objects, animations, and illustrations are all designed to increase interactivity. After the user completes the set of lesson plans, they are prompted to complete a comprehensive exam, elements of which include, multiple choice and fill-in-the blank questions, diagram labeling and the reconstruction of individual elements of disassembled pathways that encourage them to integrate all elements of the nervous system from sensation through perception to response. The first module covers the limbic system. The evaluation of the prototype is currently underway, the data will be ready for publication this summer. (Supported by N.I.H. grant #1R41NS40588-01A1).

GRANGER, Noelle A., Diane C. CALLESON\*, and Jennifer M. BURGOON. University of North Carolina School of Medicine, Chapel Hill, NC. Does student use of web-based materials in anatomy improve laboratory and examination preparedness?

Different instructional approaches are needed for teaching human anatomy in health affairs curricula to alleviate the effects of reduced dissection time and the decreasing availability of qualified instructors. The question remaining is whether these different approaches make anatomical instruction more efficient and correlative. Our approach has been to (1) create innovative multimedia instructional tools for

## Abstracts

human anatomy, available from a web platform for use in medical, dental and physical therapy anatomy curricula and (2) assess whether these tools help students prepare for the dissection laboratory more effectively, learn more efficiently, and better understand anatomical relationships. The evaluation (n=280, Year 1; n=370, Year 2) is an ongoing multi-site study involving three US medical schools, one dental school, and one physical therapy program. Data collection methods include student pre- and post-use surveys, faculty interviews, and medical student practical and written exam scores. We performed descriptive, bivariate, and regression analyses, and identified themes in the qualitative data. In Year 1, students ranked this program highly on all measures of usefulness, especially the dissection videos, and strongly agreed this is a useful learning tool. Here, we demonstrate the program and discuss whether this instructional tool contributes to improved laboratory and examination preparation, knowledge, and test scores. [Sponsored by Grant No. P116B010181 from the Fund for the Improvement of Postsecondary Education (FIPSE), US Department of Education.]

JENSEN, Mark O. Department of Surgery, University of North Dakota School of Medicine and Health Sciences, Fargo, ND. Anatomical basis of central venous catheter fracture.

Central venous catheter fracture is a rare complication of long-term indwelling subclavian venous access. As recently as 1991, subclavian access has been the recommended approach (Lafreniere, 1991). The anatomical landmark method for subclavian access remains a highly successful and non-equipment dependant method for rapid central access. A 22-gauge finder needle mitigates initial insertion complications. Remember to review the post-operative chest x-ray taken with the patient's arms down at his sides for any indication of the pinch-off sign. More recently, the internal jugular approach is emerging as the preferred long-term central venous access route. Inconsistent internal jugular anatomy makes the landmark method less reliable. Two dimensional real time ultrasound of the internal jugular is associated with better success, a lower complication rate, and faster access. Bedside ultrasound machines are readily available from commercial vendors. Our internal review of long-term central venous access procedures has caused us to re-think our methods and we have converted to a predominantly internal jugular approach. This case report and literature review may assist other physicians and institutions as they go through a similar process of evaluation regarding long-term central venous access.

## Abstracts

JERGENSON, Margaret A., Neil S. NORTON, and Laura C. BARRITT. Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE. A unique origin of the inferior alveolar artery.

The inferior alveolar artery is a major blood supply to the mandible and, in particular, the mandibular teeth. This artery typically has a very consistent path, originating from the maxillary artery and passing directly inferior until it enters the mandibular foramen, accompanied by the inferior alveolar nerve. During routine dissection of a 90 year old, female cadaver, a very unique origin of the inferior alveolar artery was observed. The artery found branched off the external carotid artery, just superior to the posterior belly of the digastric muscle. From its starting point the artery passed superiorly in the stylomandibular fascia and made a curving hook into the pterygomandibular space to enter the mandibular foramen with the inferior alveolar nerve. The position and branching pattern of maxillary artery in this case were otherwise typical. Results of surgical procedures in this area, such as sliding osteotomy of the mandible, could be impacted by this anomaly.

JEVOOR, Praful S., Sharad M. ANTIN \* and Rajesh POWAR.\* Department of Anatomy and Orthopaedics, Jawaharlal Nehru Medical College, Belgaum. INDIA. A case study of club hand and its clinical significance.

A female Child aged one year was admitted to the College Hospital with a history of deformity in both upper limbs. Physical examination revealed bilateral medial prominence, shortening of forearms and radial deviation of the hands. Plain radiograph demonstrated, bilateral absence of radius, and absence of first metacarpal in the left hand. The frequency of such rare defects occur one in 30,000 live births. Damage to the apical ectoderm on the anterior aspect of developing limb bud, leads to absence of radius, and developmental failure of corpus on radial side of the hand. Besides, skeletal deformity, abnormalities of muscles, nerves and joints are seen. A common finding is absence or deficiency of muscles arising from common extensor group, resulting in functional deficiency. However, replacement of missing radius by bone graft, and arthrodisis of the wrist are the surgical correctional procedures adopted in such rare deformities. Besides, the anatomical defects, clinical relevance would be discussed.

JEVOOR, Praful S., Sharad M. ANTIN\* and Rajesh POWAR.\* Department of Anatomy and Orthopaedics, Jawaharlal Nehru

Medical College, Belgaum. INDIA. Etiological and clinical study of congenital absence of thumb.

A plain X-ray of right wrist of a female child of eleven months old, demonstrated absence of carpal bones and first metacarpal bone. Further, that of forearm revealed absent radius and stunted growth of ulna. Non differentiation of underlying mesenchymal tissue in the developing limb bud leads to failure of development of the radial side of the carpus and hand. This results in absent thumb or if present, one that is very small and of useless function. In most cases radial two digits appear relatively normal but there is considerable restriction of movements at metacarpophalangeal, and at interphalangeal joints. Such defects are part of a rare clinical condition known as radial meromelia, which usually involves both forearms. This study was carried out, as little documentation is available in cases of unilateral nature of absent thumb. The etiological factors responsible for the defect and relevant points of clinical significance would be discussed.

JIDDOU<sup>1</sup>, Monica\*, Theodoros KAPOU<sup>2\*</sup>, and Marios LOUKAS<sup>1,3</sup>.  
<sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard School of Dental Medicine, and <sup>3</sup>Harvard Medical School, Boston, MA. Zygomaticofacial, zygomatico-orbital and zygomaticotemporal foramina, an anatomic study.

The zygomatic nerve may be disrupted on elevating periorbital from the lateral wall during orbital surgery, and care should be taken to prevent injury to the nerve during the lateral orbitotomy approach to access intraorbital soft tissue tumors. Furthermore, the introduction of anesthetics to the precise location of zygomatico-orbital (ZO), zygomaticofacial foramina (ZF) and zygomaticotemporal foramen (ZT) could be important data to the plastic and reconstructive surgeon operating in the area. We performed this study to investigate the morphologic and topographic anatomy, and the variations of the ZO, ZF and ZT. This study was performed 200 dry human skulls. The ZF, ZO and ZT foramina varied from being absent to representing as many as four small openings. For practical reasons we classify each of these foramina as Type I (ZO 50%, ZF 40%, ZT 30%), Type II (ZO 20%, ZF 15%, ZT 15%), Type III (ZO 10%, ZF 5%, ZT 5%), Type IV (ZO 3%, ZF 1%, ZT-) and V (ZO 17%, ZF 39% , ZT 50%) for single, double, triple, quadruple and absent foramina respectively. A detailed knowledge of the anatomic morphometry of this area is necessary for a surgeon while performing maxillofacial surgery and regional block anesthesia. Anatomic variations on this area may take

## Abstracts

place and a surgeon must take this into consideration so as to increase the surgical success.

JONES<sup>1</sup>, Ashley\*, Paul TRISLER<sup>1\*</sup>, Mark LOW<sup>1\*</sup>, Beaux Van SLAUGHTER<sup>1\*</sup>, and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, and <sup>2</sup>Harvard Medical School, Boston, MA. An anatomical re-examination of lateral thoracic artery.

The lateral thoracic artery (LTH) is an important source of blood supply to the pectoralis minor and major. However, detailed anatomical description of its origin, course and termination are lacking from the literature. Therefore, the aim of our study was to delineate the topography and the morphology of LTH. For this reason we studied 300 adult formalin fixed cadavers. The LTH in 90% of the cases had a typical course descending on the lateral border of pectoralis minor and supplied this muscle. In the remaining 10% of the cases the course associated with the origin of the artery. The origin LTH varied considerably. For reasons of simplicity we classified the origin into different types. Type I (70%), LTH arose from the thoracoacromial trunk, Type II (17.6%) LTH arose from the axillary artery, Type III (5.2%) LTH arose from thoracodorsal artery, Type IV (4.1%) LTH arose from subscapular artery, Type V (3.1%) multiple LTH were present, Type VI (3.3%) LTH was absent. Due to very high incidence of LTH from thoracoacromial trunk we propose to add the LTH as one of the branches of thoracoacromial trunk and re-evaluate its anatomical terminology.

JOSEPH<sup>1</sup>, Jason\* and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, and <sup>2</sup>Harvard Medical School, Boston, MA. An anatomic study on the esophageal hiatus and the crura.

The esophageal hiatus is an elliptic opening in the muscular part of the diaphragm through which the esophagus passes to the abdominal cavity. The esophageal hiatus is formed by the right and left arms of diaphragmatic crura. A diaphragmatic hernia involves a defect at the median arcuate ligament with contribution from the right and left crura. In order to investigate the morphology and the common variations of the crura of the diaphragm we examined 200 human cadavers. We were able to identify 6 different types of configuration of the right and left diaphragmatic crura. Type I (45%) the right and left crus arise from the right crus, Type II (20%) the right crus arise from the right crus and the left crus from the left crus, Type III (15%) the right and left crus arise from the right crus with an

## Abstracts

additional band from the left crus, Type IV (10%) the right and left crus arise from the right crus, with two additional (anterior and posterior) bands arising from the left crus, Type V (5%) the right and the left crus arise from the left crus with an additional band from the right crus, Type VI (5%) the right and left crus arise from the left crus with two additional bands, one from the right crus and one from the left crus. The results could be important anatomical factors in the development of gastroesophageal reflux and congenital diaphragmatic hernia.

KHAMANARONG, K., Pollasak JEERAVIPOOLWAN\*, and Siranan SIRIWAT\* Faculty of Medicine, Khon Kaen University, THAILAND. Correlation between size and angle of proximal fibula and distal radius.

The objectives of this study were to measure the size and angle of the proximal fibula and distal radius and to determine their respective correlation coefficients. We studied 190 dried fibula and radius from persons between 26 and 87 years of age. The mean circumference of the right/left fibula at 10 cm from the apex in males and females was 4.05/3.99 and 3.72/3.61 cm, respectively; and from the tip of styloid process of radius 4.03/4.00 and 3.54/3.52 cm, respectively. The mean width of the articular surface of the head of the fibula was 2.98/2.97 and 2.73/2.72 cm, respectively; and the inferior articular surface of the radius 2.37/2.36 and 2.08/2.07 cm, respectively. The mean length of the articular surface of the head of the fibula was 2.83/2.80 and 2.56/2.54 cm, respectively; and the inferior articular surface of the radius 2.86/2.84 and 2.59/2.55 cm, respectively. The mean inclination angle of the fibula was 27.21°/25.53° and 23.38°/22.76°, respectively; and of the radius 31.46°/29.17° and 30.86°/28.83°, respectively. The mean volar tilting angle of the fibula was 19.12°/17.27° and 20.28°/18.72°, respectively; and of the radius 9.39°/7.20° and 8.62°/7.83°, respectively. A low correlation exists between the size and angle of the proximal fibula and the distal radius. The practical application is that an ipsilateral or contralateral proximal fibula graft could be used for reconstruction of the distal radius after tumor removal. (Sponsored by Grant No.i 46038 from the Faculty of Medicine Khon Kaen University Thailand).

KLAPPENBERGER\*, Jürgen, Asghar SCHIRI\* pour TSCHARLOU, and Wilhelm FIRBAS. Department of Anatomy, University of Medicine, Vienna, AUSTRIA. A new device for coniotomy.

## Abstracts

In difficult cases of resuscitation a coniotomy (cricothyrotomy) can be life saving. Several instruments for coniotomy are available on the market, but have serious draw-backs like dangerous application or complicated instructions with constant need of exercising. One of the authors (J.K.) developed a new and simple instrument (Airfree ), which was tested with cadaver experiments. In twenty fresh specimens we measured the time necessary for performing the coniotomy. A small knife on the tip of the instrument is used to incise the skin in the little groove between the cricoid and thyroid cartilage. The cricothyroid ligament is perforated in a vertical direction. The instrument consists of a simple tube with a retractable knife. The depth of penetration is limited through a piece of metal, which can be used for fixing the instrument on the patient's neck. During the procedure the larynx has to be fixed with one hand in the proper position. The time of coniotomy varied between 5 and 34 second depending on the skill and professional experiences of the testing persons. After perforating the larynx the tube can be connected with a inflating bag. The correct position of the instrument was tested by inflation, by using a ruler in the tube or by endoscopy. Vulneration of the posterior wall of the larynx was not observed. The cadaver tests confirmed the usefulness of the instrument and recommend the development for production.

KYALYAN, Gohar P. Department of Human Anatomy, Yerevan State Medical University, Yerevan, ARMENIA. The dynamic of the pathomorphological and microbiological changes in initial reparatory stage of the contemporary gunshot wound.

The aim of the present complex research is to compare the dynamics of restitution of the microcirculatory bed, as well as the microorganisms' characteristics after bullet and mine-explosive injures. The object of study are the samples of soft tissues, taken from the lower limb of forte two patients with bullet (18) and mine-explosive (24) injury on 3-rd, 7-th, and 14-th days after the it. The results of study showed that the pathological processes lead to delay in the processes of recovery and to disturbances of recovery. The peculiarity of the course of the inflammation process is that it is located basically in the deep layers of the skin. These processes are more displayed during MEI due to large surface of tissue injury, which opens the wide entrance for microorganisms. Furthermore, the local disturbances of metabolism on the 7-th day after MEI enable the previous passive opportunistic pathogenic flora to grow actively, which is also accompanied by the growth of the saprophytic microorganisms. So, microorganisms are present in associations.

## Abstracts

The relationship between the endogenous and exogenous microorganisms and their relationship with the macro-organism are the factors that disturb the process of convalescence.

LAMPA<sup>1,2</sup>, Steven J., Srilatha POTLURI<sup>\*2</sup>; Ann S. NORTON<sup>\*2</sup>; and Michael B. LASKOWSKI<sup>\*1,2</sup>. <sup>1</sup>Program in Neuroscience, Veterinary Comparative Anatomy, Pharmacology and Physiology, Washington State University, Pullman, WA, and <sup>2</sup>WWAMI Medical Program, University of Idaho, Moscow, ID. A morphological technique for exploring neuromuscular topography expressed in the mouse gluteus maximus muscle.

Motor neuron pools innervate muscle fibers forming a topographic map. In the gluteus maximus (GM) muscle we demonstrated that there exists a rostrocaudal distribution of axon terminals on the muscle surface. The role of muscle fiber type in this topography is unknown. A morphological approach was designed to investigate this phenomenon. We combined three different methods in the same muscle: 1) using activity-dependent dyes to label active axon terminals to define spinal segmental origin; 2) the fluorescent labeling of acetylcholine receptors to determine motor endplate size; and 3) the immunocytochemical staining of skeletal muscle to determine fiber subtype. Applying these methods to the mouse GM we determined the relationship between fiber type and the topographic map of the inferior gluteal nerve. Results from this unique combination of techniques in the same preparation showed axon terminals from more rostral spinal nerve segments of origin are larger on rostral muscle fibers expressing myosin heavy chain IIB than caudal type IIB fibers. Because type IIB fibers dominate the GM, this suggests that for rostral axons terminal size is independent of fiber type. How this axon terminal size is related to the topographic map is the next question to be answered. (NIH NS#27024 and NCRR BRIN Program).

LIZAMORE\*, Nanette, Elrie M. MOUTON\*, Johannes M. BOON\*, and Johannes H. MEIRING. Department of Anatomy, Section of Clinical Anatomy, School of Medicine, Faculty of Health Sciences, University of Pretoria, Pretoria, SOUTH AFRICA. Emergency airway access: Dimensions and vascular anatomy of the cricothyroid membrane.

Complications encountered after the performance of a cricothyroidotomy include laryngeal damage (too large external diameter of endotracheal tube) and hemorrhage. Therefore dimensions of the cricothyroid membrane are essential to inform

## Abstracts

correct tube size selection. The aim of this study was to define dimensions of the cricothyroid membrane, as well as determining the position of the cricothyroid artery in relation to the cricothyroid membrane. After detailed dissection of 45 cadavers, four measurements were taken of the cricothyroid membrane. The anatomical position of the cricothyroid artery and its branches were noted in relation to quadrants of the cricothyroid membrane. Dimensions of the cricothyroid membrane were as follows (in mm): inferior horizontal width:  $4.0 \pm 1.5$  (mean  $\pm$  SD) (male),  $3.4 \pm 1.1$  (female); middle horizontal width:  $8.2 \pm 1.8$  (male),  $6.9 \pm 1.2$  (female); superior horizontal width:  $12.3 \text{ mm} \pm 2.0$  (male),  $10.1 \pm 1.5$  (female); Vertical measurement:  $9.4 \pm 2.2$  (male),  $10.3 \text{ mm} \pm 1.9$  (female). Sex differences were significant for the superior width and middle width of the cricothyroid membrane, indicating that females have a smaller cricothyroid membrane. The cricothyroid artery was mostly observed in the superior quadrants of the cricothyroid membrane. In conclusion, this study indicates that a different size endotracheal tube is necessary for males and females and that the safest site for an incision during the performance of a cricothyroidotomy is the inferior half of the cricothyroid membrane.

LOUKAS<sup>1,2</sup>, Marios, Joel HULLETT\*<sup>1</sup>, Shelly HOLDMAN\*<sup>1</sup>, and Danny HOLDMAN\*<sup>1</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NETHERLAND ANTILLES, and <sup>2</sup>Harvard Medical School, Boston, MA. The gross anatomy of the extrathoracic course of the intercostobrachial nerve.

Recent reports emphasize the importance of preserving the intercostobrachial nerve (ICBN) during surgical procedures (i.e. mastectomy, axillary clearance). However, a limited number of scientific reports explore the surgical anatomy of this nerve. In order to provide adequate information concerning its morphology, various branching patterns, communications with other nerves, and its final sensory distribution, we dissected 100 adult human formalin-fixed cadavers (200 axillas). In all the cadavers the ICBN was present with variant contributions from intercostal nerves T1, T2, T3, and T4. The arrangements of the ICBN were typed as 1 through 9, and possessed a diversity of characteristics, as follows. The components of Type I (45% or 90 of our specimens) included a branch to the posterior antebrachial cutaneous nerve, a branch to the anterior and lateral parts of the axilla, a branch to the medial side of the arm, and a branch to the medial antebrachial cutaneous nerve. An intra-thoracic contribution from T3 was also present in 30 of the 90 axillas in this first group. Type II (25%) describes the ICBN arising from T2

## Abstracts

and giving off a branch to the brachial plexus. In Type III (10%), lateral cutaneous branches of T2 and T3 fuse as a common trunk and then split immediately after exiting the intercostal space to form an ICBN that immediately terminates as end-branches to the axilla and limb. In type IV (5%) T2 and T3 join distally to form an ICBN that after 2 cms ends as its terminal branches. Type V (5%): T3 joins T2 from the same intercostal space proximally, with Type VI (3%) showing a very proximal branching of the sensory terminal nerves. Type VII (3%) displayed a contribution from T3 and a branch to the brachial plexus with multiple terminating branches. A contribution from T3 and T4 and a branch to the brachial plexus with multiple branches of termination comprised Type VIII (2%). Type IX (2%) showed a contribution from T3 and a communicating branch to the brachial plexus.

LOUKAS<sup>1,2,3</sup>, Marios, Robert G. LOUIS, Jr.\*<sup>1</sup>, Dorothy WHITE\*<sup>1</sup>, Joel HULLETT\*<sup>1</sup>, and Teresa WAGNER\*<sup>3</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean Saint Maarten, NETHERLAND ANTILLES, and <sup>2</sup>Harvard Medical School, Boston, MA, <sup>3</sup>Department of Pathology, Institute of Rheumatology, Warsaw, POLAND. The gross anatomy of the inferior phrenic vein.

The majority of anatomical textbooks of gross anatomy offer very little information concerning the anatomy and distribution of the inferior phrenic vein (IPV). However, in the last decade there have arisen increased numbers of reports with reference to the endoscopic embolization of esophageal and paraesophageal varices and venous drainage of hepatocellular carcinomas (HCC). The IPV is one of the major sources of collateral venous drainage in portal hypertension and HCC. The aim of this study was to identify the origin and distribution of the IPVs (right and left), both in normal and (selective) pathological cases. We have examined 300 formalin-fixed adult cadavers, without any gastrointestinal disease, and 30 cadavers derived from patients with HCC. The right IPV drained to a) inferior vena cava (IVC) in 90%, b) right hepatic vein in 8%, and c) into IVC above diaphragm in 2%. The left IPV drained to a) IVC 37%, b) left suprarenal vein 25% c) left renal vein 15%, d) left hepatic vein 14%, and e) both IVC and left adrenal vein 1% of the specimens. The IPV possessed four notable branches: ascending, esophageal, lateral and medial. The right IPV always contributed to HCCs and served as one of the major draining veins. These findings could also have major implications in the transcatheter embolization of esophageal and paraesophageal varices.

## Abstracts

LÜDINGHAUSEN<sup>1</sup>, Michael von, M. FAHR<sup>\*1</sup>, A. PRESCHER<sup>\*2</sup>, G. SCHINDLER<sup>\*3</sup>, W. KENN<sup>\*3</sup>, A. WEIGLEIN<sup>4</sup>, K. YOSHIMURA<sup>\*5</sup>, I. KAGEYAMA<sup>\*5</sup>, K. KOBAYASHI<sup>\*5</sup>, M. TSUCHIMOCHI<sup>\*6</sup>. Institute of Anatomy and Cell Biology, University of Würzburg, Würzburg, GERMANY. Acquired or congenital accessory joints between basiocciput and atlas/axis in the median plane.

According to the literature available to date, the frequently-observed reduction in the distance between the basiocciput and the superior rim of the atlas and the tip of the dens axis in cadaver specimens from elderly individuals has not been the subject of comprehensive study. Ninety-nine cadaver specimens were investigated using MRT, CT, median saw-cut sections and histological sections. Additionally, "dry" specimens of the skull (N = 110), atlas (N = 56) and axis (N = 33) were studied. In two-thirds of the median saw-cut sections, the distance between the basiocciput and the first vertebra had been reduced; the surface area of the articular planes and the length of the median atlanto-axial joint had increased due to (1) arthrosis deformans (AD) - related osseous outgrowths and osteophytes, or (2) the presence of third occipital condyles (TOCs). (1) AD-related osseous outgrowths and osteophytes were found variously on the margins of the median articular planes. In most cases, cranially-directed osteophytes had developed on the superior rim of the atlas and on the tip of the dens axis, and reduced the distance between the latter and the basiocciput. In 4 cases a large osteophyte touched the basiocciput and formed an osseous contact zone which, histologically, appeared as a real joint; its articular surfaces were covered by hyaline and fibrous cartilage. Such a joint was designated an "accessory acquired" joint. (2) In 15 cases a "free ossicle" or "isolated TOC" and in 5 cases a "fixed" TOC was found in the median plane. These TOCs had cartilaginous surfaces, which articulated with the atlas or odontoid bone or with both, thereby also forming an accessory (either atlanto-occipital, occipito-odontoid, or compound occipito-atlanto-odontoid) joint. The latter was designated an "accessory, congenitally-developed" joint. We conclude that morphological alterations related to AD (osseous outgrowths, osteophytes) or to remnants of occipital vertebrae (TOC, free ossicles) were found quite frequently in the median anterior cranio-cervical space of anatomical specimens. In a few cases an accessory cranio-cervical joint had developed in the median plane. The existence of a TOC alone implies a three-point fixation of the head and may bring about augmented cranio-cervical stability, even cervical immobility and stiffness. A TOC, forming an accessory joint, can be seen as an equivalent of the median atlanto-occipital joint

## Abstracts

normally existent in reptiles and birds. Headache, neck pain and/or cranio-cervical instability may result when a severe degree of AD and the presence of a TOC coincide. The symptoms may be reinforced when malignant and/or metabolic osteolytic alterations (intraosseous metastases and/or pseudo-gout) of the basiocciput, atlas and odontoid bone accompany AD and/or a TOC.

MACCHI\*<sup>1</sup>, Veronica, Cesare TIENGO\*<sup>2</sup>, Andrea PORZIONATO\*<sup>1</sup>, Francesco MAZZOLENI\*<sup>2</sup>, Ralph GER<sup>3</sup> and Raffaele De CARO<sup>1</sup>.  
<sup>1</sup>Department of Human Anatomy and Physiology, Section of Anatomy, <sup>2</sup>Clinic of Plastic Surgery, University of Padova, ITALY, <sup>3</sup>Surgery and Anatomy, Great Neck, New York, NY. Correlation between the course of the medial plantar artery and the morphology of the abductor hallucis muscle.

The abductor hallucis flap is frequently used as proximally based flap in the management of medial midfoot, heel and ankle defects. This large and fleshy muscle is well suited for closing calcaneal and medial malleolar lesions. The aim of the present study was to investigate the anatomical basis for this flap on 13 fresh men cadaveric feet. The Middle Plantar Artery (MPA) was studied to document the characteristics of the superficial and deep branches, their relation and course, through dissection and macroscopic analysis. The correlation of the characteristics of the course and ramifications of the MPA with the morphology of the abductor hallucis (AH) muscle indicates that 3 main patterns can be outlined: 1) Pattern A (54%): the MPA divides into two branches. The deep branch reaches the deep surface of the AH, supplying the proximal part of this muscle, and the superficial branch courses between the AH and the flexor digitorum brevis, to end as first plantar metatarsal artery. The latter supplies 2-3 small branches for the distal part of the AH. The fibers of the AH end symmetrically on the two sides of the tendon and the muscle presents an arciform shape; 2) Pattern B (38%): the MPA lacks a deep branch and continues along the lateral border of the AH as the usual superficial branch, that supplies proximal and distal collaterals to the muscle. The AH fibers mainly end on the medial side of the tendon and the muscle presents arciform shape and is located on the medial margin of the foot supero-medially with respect to pattern A; 3) Pattern C (8%): the MPA continues as a large deep branch on the deep surface of the AH and ends as medial collateral artery of the big toe. A smaller superficial branch of the MPA provides few collaterals to the AH from its proximal part and to the flexor digitorum brevis in its distal part. The AH fibers mainly end on the lateral side of the tendon and the

## Abstracts

muscle presents straight shape and an evident topography on the sole foot with respect to pattern A. From the surgical point of view, while in patterns B and C it is necessary to interrupt the main trunk of the MPA, in pattern A, the abductor hallucis flap based on the deep pedicle permit to save the superficial trunk of the MPA destined to contribute to the vascularization of the muscles of the medial loggia of the sole of the foot. The preoperative radiological study of the plantar vessels, correlated with the morphological characteristics of the AH observed during surgery, may contribute to realize a flap based on the pattern of branching of the MPA for the individual patient.

MacPHERSON, Brian R., and Don M. GASH\*. Anatomy and Neurobiology, University of Kentucky, Lexington, KY. Handling the gross anatomy teaching faculty shortage and benefiting significantly. The University of Kentucky has experienced the same shortage of trained anatomists as other institutions nationwide. As early as the 1970's the department initiated Special Titles faculty lines for individuals to essentially concentrate on teaching. These were and continue to be tenured lines. Over the past ten years we have hired a total of four faculty into these lines. Most of these individuals had some exposure to gross anatomy, were hired as assistant professors and have been mentored in both teaching development of scholarly activity. While demonstrated excellence in teaching is expected, to attain tenure these individuals must also demonstrate excellence in some form of scholarly activity - focused on but not limited to – creation of various teaching-based enhancements. Our Special Titles faculty are 12 month appointments and receive similar annual raises and merit increments to our Regular Title (teaching and research) faculty. Support for our Special Titles faculty is high among all departmental faculty. The department has created teaching awards that contribute additional salary to the Special Titles faculty based on innovations, teaching load and peer and student evaluations. To date we have created a significant number of differing web and CD-based curricular enhancements. We feel that this approach has created a faculty line with individuals that are equal partners in the twin missions of the department.

MALAKOVA\*, Olga, Kyle RAREY, and Lynn ROMRELL. Department of Anatomy and Cell Biology, University of Florida, Gainesville, FL. Clinical implications of the anatomical relationship between the pericardicophrenic artery and phrenic nerve: a new perspective.

## Abstracts

The internal thoracic artery (ITA) has been shown to be an ideal vessel for coronary artery bypass graft (CABG) surgery graft because it remains free of atherosclerosis at late follow-up in most patients. One of the major risk factors in harvesting the ITA is a phrenic nerve (PN) dysfunction. Additionally, diaphragmatic paralysis may result from the inadvertent obstruction of the left pericardicophrenic artery (PP) artery. The objective of this preliminary study was to identify the neurovascular anatomical relationship between the PN and the PP artery. The thoracic regions of twenty four embalmed cadavers (11 male and 13 female) were dissected. Digital images from of each dissection were taken and saved for analysis. All data were analyzed statistically by one way ANOVA, at  $p < 0.05$ , regarded as statistically significant. The distance between the ITA and the origin of a PP artery varied from 0.7 to 3.5 cm on the left side and from 0.7 to 3.2 cm on the right; the average distance was  $2.1 \pm 0.4$  and  $1.9 \pm 0.7$ , respectively. This variations were not statistically significant different ( $p < 0.9$ ). Obstruction of the PP artery during CABG surgery, may compromise of the PN blood supply, and resulting in ischemic damage to the PN. This is particularly likely to occur in patients with lower level of the origin of the PP artery.

MALEY, Bruce E. Department of Anatomy and Neurobiology, University of Kentucky, Lexington, KY. Integrating anatomical images into a single program.

Anatomical atlases for human anatomy courses have been a common feature for many years. Recently commercially available computer digital atlases have become available for selected areas of human anatomy such as radiology or cross sections. However, most commercial package's content often does not correspond to course content making it difficult for the student to know specifically what should be learned. We have developed software packages, using Macromedia's Authorware™, for osteology, arthrology, cross sectional anatomy, radiology and cadaveric specimens to fit the needs of the medical human anatomy course taught at the University of Kentucky, but are still easy to modify for other courses in the health professions. Images were recorded with a digital camera, modified in an imaging program and imported into Authorware 7.0™. Each area, i.e. osteology, was created as a stand alone program; however, each program could then be integrated with other modules into a single program that had a common interface making it easy for the students to navigate within the program if they know any one of

## Abstracts

the modules. This allows the program to be customized easily for the needs of a specific course.

MARCH, Crystal N.\*, Aaron J. KRYCH\*, Ross E. BRYAN\*, Ben J. PEAKE\*, Wojciech PAWLINA, and Stephen W. CARMICHAEL. Mayo Clinic College of Medicine and Department of Anatomy, Mayo Clinic, Rochester, MN. Reciprocal peer teaching: students teaching students in the gross anatomy laboratory.

Reciprocal peer teaching (RPT) is when students alternate roles as both student and teacher of their peers. The purpose of our study was to supply Anatomy educators with a resource of exercises to supplement lecture and dissection sessions. The goal was also to further examine the usefulness of RPT in acquiring anatomy concepts and developing career-long communication skills. We increased cooperative learning in the laboratory by involving students in a series of RPT activities to supplement their standard cadaveric dissections. Each day, 10% of the class practiced their demonstration with course instructors until the students felt prepared to teach their classmates. We designed one exercise for most of the 40 dissection units, permitting each student multiple opportunities to teach their peers. A questionnaire was administered to the class with a 90.5% response rate. The results are similar to earlier studies on cooperative learning in that 100% agreed the experience increased their understanding of the topics they taught, 97% agreed it increased their retention, and 92% agreed that their communication skills improved. Therefore, it is suggested that RPT be included as a supplement to existing anatomy curriculums in addition to being considered for integration in other learning arenas in medical school.

MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. The segmentation of the left lateral division of the liver. Study on corrosion casts.

Terminologia Anatomica (1998) homologates at the level of the left lateral division of the liver two segments: *Segmentum posterius laterale sinistrum*; *Segmentum II* and *Segmentum anterius laterale sinistrum*; *Segmentum III*. The anatomic reference material describes at this level a number of 1 – 3 segments. Thus: Rex (1888) and Nomina Anatomica (1989) describe a single segment. Ciobanu (1958), Diaconescu (1963), Lanz and Wachsmuth (1993) describe two segments. Platzer (1988) describes three segments. On a number of 150 hepatic corrosion casts there has been analyzed the

## Abstracts

segments number of the left lateral division and the morphological aspect of the portal vein's lateral branches. The corrosion casts were created by injection of the vasculo-ductal elements with plastic mass, followed by corrosion of the hepatic parenchyma with hydrochloric acid. An average of 90,67% presents two segments: the segment II catered for a superior lateral branch and the segment III catered for a inferior lateral branch of the portal hepatic vein. In 9,33% appears the third segment: the intermediary lateral left segment (catered for by a supplementary superior lateral branch in 2% of the cases – the segment IIa, or by a supplementary lateral inferior branch in 7,33% of the cases – the segment IIIa). The intermediary left lateral segment appears in the cases of increase of the portal hepatic veins lateral branches.

MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Agneta Maria C.PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. The segmentation of the right lateral division of the liver. Study on corrosion casts.

Terminologia Anatomica (1998) homologates at the level of the right lateral division of the liver two segments: *Segmentum anterius laterale dextrum*; *Segmentum VI* and *Segmentum posterius laterale dextrum*; *Segmentum VII*. The anatomic reference material describes at this level a number of 1 – 2 segments. Thus: Rex (1888), Hjörstjö (1948), Diaconescu (1963) and Nomina Anatomica (1989) described a single segment. Healey et al. (1953), Couinaud (1954), Ciobanu (1958), Platzer (1988) and Lanz and Wachsmuth (1993) described two segments. On a number of 150 hepatic corrosion casts there has been analyzed the segments number of the right lateral division and the morphological aspect of the portal vein's posterior branches. The corrosion casts were created by injection of the vasculo-ductal elements with plastic mass, followed by corrosion of the hepatic parenchyma with hydrochloric acid. In 78,67% of the cases there are present two lateral right segments of equal sizes: segment VI and segment VII. In 21,3% there are present three segments with two distinctive variants: posterior predominance (with two posterior segments – VIIa and VIIb and an anterior segment - VI) and the other with anterior predominance (two anterior segments – VIa and VIb and a posterior segment – VII). In 11,33% is revealed the paracaval segment – VIc. The difference of 2-3 lateral right segments is due to the modality of primary or secondary division of the portal hepatic vein's posterior branch.

## Abstracts

MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. The segmentation of the right medial division of the liver. Study on corrosion casts.

Terminologia Anatomica (1998) homologates at the level of the right medial division of the liver two segments: *Segmentum anterius mediale dextrum* – *Segmentum V* and *Segmentum posterius mediale dextrum* – *Segmentum VIII*. The anatomic reference material describes at this level a number of 1 – 2 segments. Thus: Rex (1888) and Nomina Anatomica (1989) describe a single segment. Hjörstjö (1948), Healey et al. (1953), Couinaud (1954), Ciobanu (1958), Diaconescu (1963), Platezer (1988) and Lanz and Wachsmuth (1993) describe two segments. On a number of 150 hepatic corrosion casts there has been analyzed the segments number of the right medial division and the morphological aspect of the portal vein's anterior branch. The corrosion casts were created by injection of the vasculo-ductal elements with plastic mass, followed by corrosion of the hepatic parenchyma with hydrochloric acid. An average of 98,67% presents two right medial segments (anterior – V and posterior VIII). An average of 1,33% presents four segments (two anterior: proximal – Va and distal Vb and two posterior: proximal VIIIa and distal VIIIb). The presence of two segments is due most often by the forking of the portal hepatic vein's anterior branch (91,89%) or the trifurcation of the right branch in posterior branch and two segmentary anterior branches (8,11%). The presence of four segments is due to the branches division with the origin in the portal hepatic vein's anterior branch.

MATUSZ, Petru L., Dorina V. SZTIKA\*, Delia Elena D. ZAHOI\*, Mioara V. FARCA URECHE\*, and Agneta Maria C. PUSZTAI\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. The segmentation of the left medial division of the liver. Study on corrosion casts.

Terminologia Anatomica (1998) homologates at the level of the left medial division of the liver only one segment: *Segmentum mediale sinistrum* – *Segmentum IV*. The anatomic reference material describes at this level a number of 1 – 3 segments. Thus: Rex (1888) Couinaud (1954), Diaconescu (1963) and Nomina Anatomica (1989) describe a single segment. Hjörstjö (1948), Healey and all. (1953), Ciobanu (1958), Diaconescu (1963), Lanz and Wachsmuth (1993) describe two segments. Platezer (1988) describes three segments. On a number of 150 hepatic corrosion casts there has been

## Abstracts

analyzed the segments number of the left medial division and the morphological aspect of the portal vein's medial branches. The corrosion casts were created by injection of the vasculo-ductal elements with plastic mass, followed by corrosion of the hepatic parenchyma with hydrochloric acid. An average of 84,67% presents a single left medial segment. In 10% of the cases there are present two medial segments (left posterior – IVa and left anterior – IVc). In 5,33% of the cases there are present three segments (at the segments IVa and IVc being associated also the left medial intermediate segment – IVb). The presence of the single left medial segment is determined by the existence of the multiple medial branches, of small sizes. The presence of two or three segments is determined by the existence of individualized medial branches of the portal hepatic vein.

NASH<sup>\*1</sup>, Lance G., Helen NICHOLSON<sup>\*1</sup>, Antonio S.J. LEE<sup>\*1</sup>, Gillian JOHNSON<sup>\*2</sup>, and Ming ZHANG<sup>\*1</sup>. <sup>1</sup>Department of Anatomy & Structural Biology, School of Medical Science, and <sup>2</sup>School of Physiotherapy, University of Otago, Dunedin, Dunedin, NEW ZEALAND. (sponsored by B. R. MacPherson). The morphology of craniocervical connective tissue forming the posterior atlanto-occipital membrane. Abnormal biomechanics of the meningo-vertebral ligaments that anchor and align the posterior spinal dura associated with the posterior atlanto-occipital (PAO) membrane is one of the underlying mechanisms in the etiology of cervicogenic pain. The aim of this study was to investigate the architecture of the PAO membrane to determine its fibrous composition and construct a 3-dimensional image using sheet plastinations and cadaveric dissections in conjunction with confocal microscopy. Twenty-two formalin-fixed human adult cadavers (16 males and 6 females, aged 65 – 89 years) were used. Gross anatomical dissections were performed of nine cadavers. Thirteen specimens were plastinated; five of, which were further, examined by confocal microscopy. The results of this study found clear evidence that: (1) the medial and deep antero-inferiorly oriented tendon fibres from RCPm muscle directly connected with the spinal dura. (2) The PAO membrane originates from fascia and tendon of rectus capitis posterior minor (RCPm) and surrounding perivascular sheathes. (3) Antero-inferiorly, the PAO membrane fuses with the spinal dura rather than C1. (4) The nuchal ligament is not clearly present in the PAO interspace, and there was no evidence of attachment with the spinal dura. We conclude, that the connective tissue structures that connect the

## Abstracts

spinal dura to the RCPm muscle in the PAO interspace are the RCPm fascia and tendon fibres and perivascular sheathes.

NIEDER, Gary L., Lynn A. WAGNER\* and Frank NAGY\*. Department of Anatomy and Physiology, Wright State University School of Medicine, Dayton, OH. The QuickTime VR Anatomical Resource: A library of shared photorealistic virtual specimens.

QuickTime Virtual Reality (QTVR) is a well established technology used to deliver photorealistic representations of three dimensional objects. It has proven to be an excellent medium for preserving and sharing three-dimensional anatomical specimens on line. The strength of photo-based VR is its ability to capture fine surface features and textures, creating an impression of a real specimen that continues to be elusive to rendered model virtual specimens. QTVR objects can be readily incorporated into web-based or standalone computer-aided instructional programs. For example, we are currently developing a second generation web-based skull anatomy program using QTVR. The QuickTime VR Anatomical Resource is a freely accessible collection of virtual anatomical specimens that can be viewed on line or downloaded for a variety of uses in medical education. A work in progress, the collection currently includes bones as well as various organs, regional dissections and embryological specimens. Each specimen is available to users in several screen sizes to fit varied needs. In the past year our virtual specimens have been viewed or downloaded over 30,000 times by clients in 85 countries. Approximately 20% of those downloads were to clients outside the United States. (Sponsored by Grant LM06924 from the National Library of Medicine).

NORTON, Neil S., Margaret A. JERGENSON, Alan T. RICHARDS, and Thomas H. QUINN, Departments of Oral Biology and Biomedical Sciences, Schools of Dentistry and Medicine, Creighton University, Omaha, NE. Revisiting nonrotation of the midgut in the cadaver: a case report.

The development of the gastrointestinal system is a complex process of embryonic development involving growth and rotation in the foregut, midgut, and hindgut. In this abstract, we report a cadaveric anomaly of the midgut, which forms part of the duodenum, jejunum, ileum, cecum, appendix, ascending colon, and most of the transverse colon. These structures are supplied by the superior mesenteric artery. As the midgut elongates during development while suspended by the dorsal mesentery, it is herniated to provide for additional growth while the liver occupies the majority of the

## Abstracts

intraembryonic coelom. The midgut will rotate a total of 270° counterclockwise and the organs reach their final adult location. Thus, any improper step can lead to a variety of congenital anomalies including omphalocele, umbilical hernia, stenosis, volvulus, gastroschisis, and reversed rotation. We report a case of nonrotation of the midgut in an 85 year old female cadaver. In this specimen, the midgut loop failed to rotate. Thus, the small intestine was located entirely on the right side of the abdominal cavity and the entire large intestine was located on the left side. All of the vascular supply to the midgut organs were still derived from the superior mesenteric artery.

OOMMEN, Anitha , and Avinash Vasant MAINKAR\*. Department of Anatomy, K. S. Hegde Medical Academy, Karnataka, Mangalore, SOUTH INDIA. A case report on venous anomalies of the neck.

During the routine dissection, we came across a combination of anomalies, with abnormal origin of external jugular vein, unusual course and termination of facial vein and a communication of both veins on the left side in a male cadaver. On the right side, the facial vein joined the retromandibular vein but the termination was into the internal jugular vein. The origin of the external jugular vein was abnormal on either side in this cadaver. On both sides, the external jugular vein was lying deep to the sternocleido-mastoid and seemed to be taking origin from suboccipital venous plexus. The clinical relevance of such a variation is discussed.

OOMMEN, Anitha, A. MAINKAR\*, and Tom OOMMEN\*. Department of Anatomy, KSHEMA, Mangalore, Karnataka, INDIA. A study on the correlation between the hand length and foot length in humans.

Human beings are considered to be bilaterally symmetrical. However, Levy et al (1978) showed that there was an asymmetry in the length of the feet irrespective of sex or handedness. This observation was contradicted by Taylor et al (1981). Amirshaybani et al (2000) further observed that the hand length could predict body weight and body surface area independent of the sex of the individual. But there was no data available in the literature showing the relationship between hand length and foot length. Therefore the present study was undertaken to determine any relationship between hand length and foot length. One hundred normal human subjects (50 males and 50 females) between the ages of 19 ñ 25 years and with no deformities or previous history of trauma to the hands or feet were selected for the study. The lengths of their hands and feet were measured on both sides using a graduated scale. The

## Abstracts

measurements were analyzed statistically. The results showed a highly significant correlation ( $p < 0.0001$ ) between hand length and foot length in both sexes though there was no significant difference in the hand length and foot length on both sides or between the sexes. The results indicate that if the foot length is known the hand length can be determined and vice versa. This could be of medico-legal significance in profiling or identification of body parts.

OXORN\*, Valerie M., Anne M. R. AGUR, and Nancy H. McKEE\*. Divisions of Anatomy and Plastic Surgery, Department of Surgery, University of Toronto, ON. Muscle architecture of the human gastrocnemius muscle: A comparison of historic, photographic and digitized images.

A review of historic, photographic and digitized images of the medial and lateral heads of the gastrocnemius muscle was conducted using historical plates, photographs of fresh and embalmed cadaveric specimens, and three-dimensional reconstructions of data from digitized cadaveric specimens. The muscle architecture as represented in the historical plates published from the sixteenth to the twentieth century (e.g. Albinus, Bidloo, and Quain) was compared to dissections of fresh and cadaveric specimens, as well as to the data collected from digitized specimens using a Microscribe 3D-X Digitizer. The muscle architecture depicted in some illustrations corresponded well with the cadaveric dissections, but in most cases the illustrations were not consistent with direct observation. Errors were discovered in the representation of aponeuroses, tendons and fiber bundle orientation. Ideally, when generating new images, anatomists, medical professionals and biomedical communicators should refer to specimens rather than rely solely on previously rendered images.

PETERSON,\*<sup>1</sup> Cathryn A., and Richard P. TUCKER\*<sup>2</sup>. <sup>1</sup>Department of Physical Therapy, University of the Pacific, Stockton, CA, <sup>2</sup>University of California at Davis School of Medicine, Department of Cell Biology and Human Anatomy, Davis, CA (sponsored by B. J. Schmitt). Medical human gross anatomy: correlates of performance. Human gross anatomy is one of the foundations upon which medical education is built. This study examines: 1) What undergraduate coursework is associated with performance in medical anatomy, and 2) Is performance in medical anatomy associated with performance on the United States Medical Licensing Examination Step 1 (USMLE)? The study includes data from 379 students enrolled at the UC Davis School of Medicine who took medical anatomy between 1998 and 2002. Data collected include performance in a variety of

## Abstracts

undergraduate courses, rank in medical anatomy, performance on the medical anatomy final exam and USMLE scores. Analyses show significant ( $p < 0.01$ ) correlations between performance in undergraduate biology, organic chemistry, physics and gross anatomy laboratory and medical anatomy rank. In contrast, there are no significant correlations between grades in undergraduate gross anatomy, kinesiology or comparative anatomy and performance in medical anatomy. Performance on the cumulative medical anatomy final exam is highly correlated with performance on the USMLE. The findings of this study indicate that undergraduates seeking enrollment into medical school may benefit from undergraduate course work in anatomy that includes laboratory experience. Moreover, performance in medical anatomy may be a useful indicator for targeted counseling to promote greater success with the USMLE.

PIETRASIK<sup>1,4</sup>, Kamil, Leopold BAKON<sup>\*1,3</sup>, Zbigniew GALAZKA<sup>\*4</sup>, Magorzta BRZOZOWSKA<sup>\*2</sup>, and Bogdan CISZEK<sup>\*1</sup>. <sup>1</sup>Department of Anatomy, <sup>2</sup>Department of Forensic Medicine, <sup>3</sup>Department of Radiology, <sup>4</sup>Department of General, Vascular and Transplant Surgery, The Medical University of Warsaw, Poland. Radiologic anatomy of lumbar arteries – clinically oriented study.

Recent progress in endovascular treatment of abdominal aortic aneurysm (AAA) draw clinicians' attention towards side branches of the abdominal aorta, particularly those which have a potential to develop 2<sup>nd</sup> type of endoleak. The purpose of our study was to evaluate radiologic anatomy of lumbar arteries to provide clinicians with most accurate data useful in diagnostic and therapeutic procedures performed on these vessels. The study was conducted on 150 *post mortem* aortograms, performed in 50 adult human cadavers (25 male, 25 female; mean age 38 years). After ligation of celiac trunk, superior mesenteric artery and distal parts of renals and external iliac arteries, radiopaque contrast was injected through thoracic aorta. Standard X-rays were performed in free projections: anterior-posterior (AP), right lateral (RL) and left lateral (LL). Total of 150 X-rays were blinded and analyzed by three independent radiologist. Following distances were measured on each aortogram: lumbar artery (LA) - renal artery (RA), LA - aortic bifurcation (AB), RA - AB. Points of origin of lumbar arteries from abdominal aorta were related to vertebral column. Means were calculated and statistical verification performed. Common origin of lumbar arteries arising from aorta at the same segmental level was present in 30% of all studied vessels. There were following results of measurements performed on

## Abstracts

AP aortograms (mean values in mm): right side LA1-RA 11.3 (above RA), LA2-RA 20.5, LA3-RA 50, LA4-RA 75 and LA1-AB 127, LA2-AB 88.5, LA3-AB 56, LA4-AB 28.5; left side LA1-RA 13.5 (above RA), LA2-RA 16.5, LA3-RA 48, LA4-RA 78 and LA1-AB 130, LA2-AB 90, LA3-AB 58, LA4-AB 28. Means of performed measurements on lateral projection aortograms were as follows: (RL projection) LA1-RA 10.5 (above RA), LA2-RA 26, LA3-RA 58, LA4-RA 82 and LA1-AB 119, LA2-AB 80, LA3-AB 50, LA4-AB 23.5; (LL projection) LA1-RA 12.6 (above RA), LA2-RA 22, LA3-RA 54, LA4-RA 82 and LA1-AB 119, LA2-AB 81, LA3-AB 51, LA4-AB 24. First pair of lumbar arteries originated most frequently from posterior wall of abdominal aorta at the level of intervertebral disc L1/L2, second pair – intervertebral disc L2/L3, third pair – lower 1/3 of vertebral body L3, fourth pair – upper 1/3 of vertebral body L4. Common origin of lumbar arteries of the same segmental level is more frequent than previously described. First pair of lumbar arteries originate most frequently from posterior wall of abdominal aorta above or at the level of renal arteries. There are significant differences in measurements of points of origin of lumbar arteries from abdominal aorta performed on anterior-posterior and lateral projection aortograms. Lateral projection aortogram provide better visualization of points of origin of lumbar arteries and should be preferred in diagnostic and therapeutic procedures performed on these vessels. (Sponsored by Grant No. 6P05C01821 from the Ministry of Scientific Research and Information Technology Republic of Poland)

PORZIONATO\*<sup>1</sup>, Andrea, Veronica MACCHI\*<sup>1</sup>, Mario GARDI\*<sup>2</sup>, Anna PARENTI\*<sup>3</sup> and Raffaele DeCARO\*<sup>1</sup>.<sup>1</sup>Department of Human Anatomy and Physiology, Section of Anatomy, University of Padova, ITALY. <sup>2</sup> Urological Clinic, Department of Surgical and Oncological Sciences, University of Padua, ITALY. <sup>3</sup> Department of Oncological and Surgical Sciences, Section of Pathologic Anatomy, University of Padova, ITALY. Histotopographic study of the rectourethralis muscle.

Radical perineal prostatectomy has been increasingly used with diffusion of laparoscopic pelvic lymph node dissection and recent protocols of risk stratification. Section of the rectourethralis muscle (RUM) is necessary for access to the retroprostatic space, however during this procedure rectal injuries may be produced. In this work, we studied the topography and morphology of the RUM which, despite its importance in perineal surgery, have not been univocally described in the literature. After in situ formalin fixation, the pelvic viscera were removed from 16 male cadavers (range of age: 54-72

## Abstracts

years) and from 4 full-term infants (range of gestational ages: 37-38 weeks). Serial macrosections of the bladder base, prostate gland, and lower rectum cut in horizontal (6 adults and 2 infants) and sagittal (6 adults and 2 infants) planes, underwent histological (H.E., azan-Mallory and Weigert's staining) and immunohistochemical (anti-smooth muscle actin and anti-sarcomeric actin) study. The remaining 4 adult specimens were cut on horizontal and sagittal planes and plastinated using epoxy resin E12 sheet procedure. RUM was identified in 10/12 (83%) adult specimens and in 4/4 (100%) infant specimens. In both sagittal and transverse sections, it showed a triangular-shaped configuration. In all the cases, at the level of its posterior portion, fibres continuing with rectal longitudinal muscular layer were visible. Anteriorly, the mean ( $\pm$  SD) distance between the RUM and the membranous urethra was 5.3 ( $\pm$  1.25) mm in adult and 1.0 ( $\pm$  0.41) mm in infant. Location of RUM in the prerectal space and the absence of urethral insertion makes more correct the original denomination of "prerectal" muscle, formerly used by Henle. In 7/10 (70%) adult cases and in 1/4 (25%) infant cases, muscle fibres were densely packed in the lateral sides while in the central portion connective tissue was prevalent, with sparse smooth muscle fibres. Immunohistochemical stainings showed the almost total prevalence of smooth fibres in the context of the muscle. In all the infant specimens the RU muscle was clearly separated from the levator ani, while, in 8/10 (80%) adult cases, striated fibres of the levator ani and smooth fibres of the rectourethralis muscle were mingled together, so that a mechanical cooperation between the two muscles, in the elderly, may be hypothesized

PUNDI, Kavitha\*, Duane A. MORROW\*, and Robert J. SPINNER. Mayo Clinic, Depts. of Orthopedics and Neurologic Surgery, Rochester, MN. A three-dimensional animation program can display anatomic and biomechanical explanations for snapping triceps.

Snapping of the medial triceps is a dynamic condition in which the distal triceps dislocates (snaps) over the medial epicondyle during elbow flexion. It typically occurs with a dislocating ulnar nerve. Individuals with snapping triceps may have elbow pain, snapping, or ulnar nerve symptoms. This condition is frequently misdiagnosed and is not well understood. We have previously noted that anatomic variations in the triceps or bony malalignment (especially cubitus varus) or bony deformity (hypoplasia of the medial epicondyle) may result in snapping. These clinical observations are supported by mathematical and mechanical models that were designed to simulate the effect that bony abnormalities at the distal humerus and

## Abstracts

soft tissue variations of the distal triceps have on the line of pull of the triceps. A three-dimensional analysis of the bony and soft tissue relationships would facilitate our understanding of the pathogenesis and the treatment of this clinical disorder. Patient examples will be presented to illustrate the clinical entity of snapping triceps. Predisposing anatomic findings will be explained using a mathematical model. These results will be displayed by using SIMM (Software for Interactive Musculoskeletal Modeling), a graphics-based software package (MusculoGraphics, Inc, Santa Rosa, CA) that facilitates three-dimensional modeling applications. SIMM can aid in the construction, modeling, animation and analysis of three-dimensional problems affecting musculoskeletal systems. It can be successfully implemented in analyzing the effects of bony abnormalities at the distal humerus and soft tissue variations of the distal triceps on the changes in the triceps line of pull, and potentially, in correcting these changes. Of the bony changes, varus malalignment had the greatest effect. Negligible effects on the line of pull were seen with internal or external rotation, and with flexion or extension malalignment. Of the soft tissue alterations, displacement of the triceps insertion had a greater effect than translation of the triceps origin. Treatment should aim to restore normal triceps biomechanics with soft tissue or bony procedures. A three-dimensional interactive, visual display can be useful in understanding anatomic relationships that may not be intuitively obvious. SIMM can successfully be adapted to explain the anatomic and biomechanical principles that result in snapping triceps, or treat this medical condition.

RAJGOPAL\*, Lakshmi, Lopa A. MEHTA\*, and P. S. BHUIYAN\*. Department of Anatomy, Seth G.S.Medical College and K.E.M. Hospital, Mumbai, INDIA. (sponsored by B.R. MacPherson) Ulnar tunnel - anatomical features that favor entrapment neuropathy.

Anatomy of ulnar tunnel or Guyon's canal is seldom clearly described in literature. During routine dissection, it was found that the hypothenar muscles very often form a thick roof over the tunnel. Aim: To study the anatomy of ulnar tunnel especially with reference to its boundaries and to study the level of branching and the branching pattern of ulnar nerve. Ninety-three hands from 52 formalin-fixed cadavers were carefully dissected to expose the ulnar tunnel. The structures forming the roof of ulnar tunnel were demarcated. The site of branching of ulnar nerve with reference to pisiform was noted down. Structures covering the exit of the nerve from the tunnel were also noted down. Results indicated that in 90

## Abstracts

specimens, the roof of the tunnel was formed by the fleshy muscular origin of abductor digiti minimi and /or flexor digiti minimi. In two hands there was an additional anomalous muscle belly roofing the canal, which then joined with abductor digiti minimi. In 40 hands, the site of division of ulnar nerve into superficial and deep branches was at the level of pisiform and just lateral to it; in 45 hands it was distal to pisiform and in eight hands it was proximal to pisiform. It was concluded that variations do have a clinical significance with reference to entrapment neuropathy of the ulnar nerve at the wrist and occupational ulnar nerve lesions.

RAOOF, Ameer, Roy GLOVER\*, Sabine HILDEBRANDT\*, Rakin AHMED\*, and Carla BRYANT\*. Division of Anatomical Sciences, Office of Medical Education, The University of Michigan Medical School, Ann Arbor, Michigan. Not just another required course: advancing the effectiveness of undergraduate anatomy education.

General issues of concern related to undergraduate anatomy education include the diversity of students' backgrounds and motives that are reflected often unfavorably on their course performance. At the University of Michigan Medical School undergraduate anatomy has been taught as required lecture-based course offered during the Fall semester. A wide array of new measures intended to improve students' awareness and comprehension was implemented two years ago. This year the measures were further refined and included: lecture objectives distributed to students at the beginning of the semester; more regular quizzes; lab visits were more frequent and more appropriately timed; and the course's web was enhanced. Analysis of scores showed a statistically significant improvement in class's final grades compared to last year's. Students expressed greater satisfaction with the new measures especially the lab visits and the PowerPoint presentations. We conclude that the implementation of the new measures has been effective in improving students' performance in anatomy. Their increased interest in lab visits reflects to a certain extent an enhanced awareness of the usefulness of anatomical knowledge. We believe that this has been a modest step in transforming students' perception of anatomy from being just a required course to a more interesting learning experience.

REEVES, Rustin E., Harold J. SHEEDLO\*, and Rouel S. ROQUE\*. Department of Cell Biology and Genetics, University of North Texas Health Science Center, Fort Worth, TX. Increasing graduate student interest and participation in human gross anatomy courses.

## Abstracts

Graduate students at the University of North Texas Health Science Center (UNTHSC) have been reluctant to take a human gross anatomy course. Faculty mentors have noted the time constraints on such a large course, and its effect on their research. Over the past 5 years, the anatomy-teaching faculty have restructured the anatomy program for graduate students by developing several anatomy courses offered during the school year. This change was made possible with the implementation of a systems-based approach to teaching anatomy in our medical school. With this change, faculty were able to design courses based on particular body systems, or other courses that span the fall or spring semester, but not the entire year. Until 1998, a graduate student at UNTHSC desiring to take human gross anatomy would have to register for 13 semester credit hours (SCH), which rarely occurred because of faculty mentor disapproval. However, after the development of 6 separate anatomy courses covering the entire human body, we have had an influx of graduate student participation. These courses range from 3 to 7 SCH, making them more appealing to graduate faculty mentors trying to keep their graduate students focused on research.

SALKOWSKI<sup>2</sup>, Lonie R., Guillermo F. CARRERA<sup>2</sup>, David L. BOLENDER<sup>1</sup>, and Gary L. KOLESARI<sup>1,3</sup>. Department of Cell Biology, Neurobiology and Anatomy<sup>1</sup>, Department of Radiology<sup>2</sup>, and Department of Family and Community Medicine<sup>3</sup>, Medical College of Wisconsin, Milwaukee, WI. Radiology in the basic science clinical anatomy lab: an objective measure of this integration.

Traditionally human anatomy has been taught by correlating dissection with written text and 2-dimensional diagrams. Students are expected to synthesize this information and then apply it to future clinical settings in their clerkships, during a physical examination or the evaluation of diagnostic imaging tests. This transition, although theoretically possible is sometimes a difficult concept to teach. The Clinical Human Anatomy course is therefore an opportune time to begin the introduction of these clinical skills with radiologic imaging studies as they relate to the anatomy being studied. Imaging studies ranging from conventional radiographs to cross-sectional and angiographic imaging, were presented by radiologists in didactic lecture format, hands-on laboratory settings, and web-based formats. The images were presented to demonstrate normal anatomy and pathology as illustrations of the importance of an anatomical structure. The students were given two radiologic anatomy questions during each lab practical examination. Overall the students performed statistically better on the lab practical

## Abstracts

examination, 92.12%, compared to the radiology exam questions, 87.86% ( $p < 0.001$ ). Furthermore, within the radiology questions, there was a significant difference in the ability to analyze normal structures on a plain film image compared to cross-sectional images, 97.96% versus 71.04%, with a  $p < 0.001$ . With the ever-growing importance of cross-sectional imaging in clinical practice, this finding suggests that more cross-sectional anatomical teaching is needed during the basic anatomy class.

SAXTON\* Ernestina H., James D. COLLINS, Samuel S. AHN\*, Theodore Q. MILLER\*, and Alfred CARNES\*. Departments of Neurology, Radiological Sciences, and Vascular Surgery, UCLA School of Medicine, Los Angeles, CA. Obstruction of dural sinus venous drainage in thoracic outlet patients with migraine as displayed by magnetic resonance imaging (MRI), angiography (MRA) and venography (MRV).

Patients with thoracic outlet syndrome (TOS) and migraine complain of upper extremity pain, numbness and tingling, and autonomic symptoms such as temperature and color changes, along with the headache. Repetitive arm use and arm abduction external rotation (AER) trigger both TOS symptoms and migraine attacks. Bilateral MRI, MRA and MRV display venous obstruction caused by costoclavicular compression in TOS patients with migraine without the use of contrast material. Changes in blood flow are displayed according to proton density. The 2D-Time of Flight MRA and MRV in-phase codes blood such that diminished blood flow is displayed as decreased proton density. Multiplanar imaging was conducted on a 1.5 Tesla Signa, GE LX (Clin.Anat. 1995; 8:1-16). The field of view was modified to include the dural sinuses. The images displayed asymmetric dilatation and/or asymmetric signal intensities of the dural sinuses reflecting compression of the bicuspid valves within the draining veins and lymphatics of the neck, supraclavicular fossae and upper extremities. The dural sinus was dilated and of higher signal intensity on the side of greater impedance to cerebral venous outflow by costoclavicular vascular compression. The TOS and migraine symptoms were more severe on the side of greater obstruction to venous drainage. This presentation displays obstruction to dural sinus venous sinus drainage in migraine patients with TOS as a result of trauma with whiplash injury and with occupational repetitive strain injury.

SCHABORT<sup>1</sup>, D., J. M. BOON<sup>1</sup>, P.J. BECKER<sup>2</sup>, J. H. MEIRING<sup>1</sup>.  
<sup>1</sup>Department of Anatomy, Section of Clinical Anatomy, School of

## Abstracts

Medicine, Faculty of Health Sciences, University of Pretoria, <sup>2</sup>Unit of Biostatistics, Medical Research Council, Pretoria, SOUTH AFRICA. Easy identifiable bony landmarks as an aid in targeted regional ankle blockade.

Regional anesthesia around the ankle joint is well suited to a large number of surgical procedures of the foot. Previous studies have alluded to the variable nerve distribution of the foot, which may result in incomplete blocks. The aim of the study was to determine the position of the nerves in relation to the ankle joint to easily identifiable bony and prominent soft tissue landmarks to aid more accurate targeting of these nerves. A number of 94 ankles (47 left; 47 right) were dissected to expose the tibial, sural, deep fibular (peroneal), superficial fibular (peroneal) and saphenous nerves. The distance of the nerves relative to easy to find bony landmarks was measured. A distance ( ) was measured from the middle of the tibial nerve to the most medial aspect of the medial malleolus. Measurement was considered from the inferior tip of the lateral malleolus to the anterior border of the sural nerve on a horizontal plane. Measurement was taken from the medial border of the deep fibular (peroneal) nerve to the most anterior aspect of the medial malleolus. was measured from the middle of the superficial fibular (peroneal) nerve to the most anterior aspect of the medial malleolus on a horizontal plane. The saphenous nerve was measured ( ) from its medial border to the most anterior aspect of the medial malleolus on a horizontal plane. Factors as sex, length and ankle side were also analyzed concerning their influence on the position of the nerves. This study suggests that a greater degree of certainty may possibly be attained when palpable and easy to find bony landmarks are used to determine the position of the nerves around the ankle and ensure a simple to perform, predictable and selectively targeted block.

SEIFERT, Mark F., and Ronald L. SHEW. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Indianapolis, IN. The use of an overhead camera and monitor system in the gross anatomy laboratory.

We teach a medical gross anatomy course to a class of approximately 190 first-year medical, physical therapy, and anatomy graduate students. In the laboratory portion of the course, students participate in assigned dissections that encompass each region of the human body. In previous years, students from each dissection table (6 per table) received short (7-10 mins) presentations over projected material that communicated instructions and

## Abstracts

demonstrated the anatomy they should see during that day's laboratory session. This was a time-consuming process that required multiple rotations of table groups to complete the demonstrations to the entire class. Student criticism included not being able to adequately see or hear what was being demonstrated or that there was a lengthy delay before getting to see a demonstration. To alleviate some of these problems and time pressures, we have begun use of an overhead camera system (*Sky-Eye Camera*) connected to multiple plasma screen monitors. This system is capable of zooming in and out for close-up or panoramic views of the dissection field and has enabled us to deliver a single "broadcast" presentation to the entire class, highlighting what students are to see that day and providing other helpful pointers to aid them in their dissections. These single presentations have permitted the faculty and fourth-year medical student teaching assistants to devote more time engaging students and assisting them with their dissections. This has reduced student frustration and increased student attendance and participation in the laboratory. A student survey response to our usage of this system was very positive. On a 5-point Likert scale, 84% of respondents either agreed or strongly agreed that the projection presentations prepared them for the day's dissection and 89%, likewise, agreed that these presentations enhanced their educational experience in the laboratory. This technology can increase the efficiency and utilization of lab instructors and is adaptable for either universal coverage of lab material or for small group learning environments. In addition, video recording capabilities permit local preparation and student review of lab material.

SHEETZ, James H., and John A. CALDWELL\*. Department of Cell Biology and Office of Curriculum Development and Management, University of Alabama School of Medicine, University of Alabama at Birmingham (UAB), Birmingham, AL. Modification of commercially available testing software for computerized histology practical exams.

In an effort to utilize available digital technology and to expose students to more computer based exams, histology practical exams in a course of Medical Cell and Tissue Biology (MCTB) are administered on a computer. Images for the practical exams are acquired with a digital camera-equipped microscope or by digital scanning of 35mm slides. Captured images are enhanced utilizing Adobe *Photoshop 7.0*<sup>®</sup>. The practical exam is constructed utilizing *Perception-3*<sup>®</sup> (Question Mark Corp.) testing software. By modifying

## Abstracts

the HTML codes within the program, an exam can be constructed with a screen desktop displaying (1) a text question; (2) an image frame; (3) navigation buttons allowing students to view different images on the desktop; (4) an answer space; and (5) buttons allowing students to navigate to different questions. For security, questions can be randomized for each student. Students acquire answers from a numbered wordlist that is available to them and record the appropriate number in the desktop answer box. The software can generate grade sheets and different forms of statistical data for each question and the entire exam. Responses from students have been overwhelmingly positive. This format for practical exams allows the building of image(question) libraries and provides flexibility in generating future exams.

SNYDER, Mary C\*, and RICHARDS, Alan T. University of Wisconsin Hospital and Clinics, Division of Plastic and Reconstructive Surgery, Madison, WI (MCS) and University of Nebraska Medical Center, Division of Head and Neck Surgery (ATR) NE. Low bifurcation of the carotid artery: embryologic basis and clinical implications.

During dissection of an adult female cadaver, abnormal position of the carotid bifurcation was noted. The bifurcation of the right carotid artery was identified at the level of the thyroid gland, approximately C7. The left carotid bifurcation was found at the inferior border of the thyroid cartilage, approximately C6. The right superior thyroid artery arose from the external carotid and took an ascending course to reach the superior pole of the thyroid gland. On the left, the superior thyroid artery followed a more normal descending path to the thyroid gland. The internal carotid arteries were normally positioned lateral to the externals on both sides, and the remaining branches of the external carotid did not appear anomalous. The bifurcation of the common carotid is most commonly located at the upper border of the thyroid cartilage, which corresponds to the fourth cervical vertebra. Bifurcation at the level of C6 to C7 is reported in only 0.15% of cases. A study of the embryology of the carotid system yields clues to the development of the low carotid bifurcation. Clinicians who deal with disease of the carotid arteries should be vigilant for these anomalies because of the potential for diagnostic difficulties and intraoperative complications.

SPINNER, Robert J., Murali SUNDARAM\*. Mayo Clinic, Depts. of Neurologic Surgery and Radiology, Rochester, MN. Clinical confirmation of the dual innervation of the brachialis muscle.

## Abstracts

The innervation of the brachialis muscle has been incompletely understood by both anatomists and clinicians. Some authors have considered the musculocutaneous nerve as the sole innervator of the brachialis muscle, while others who acknowledge a dual innervation from the musculocutaneous and radial nerves suggest that the radial nerve contribution to the muscle is sensory. Two patients with isolated high radial nerve lesions and one patient with a musculocutaneous nerve paralysis localized to the brachialis muscle (distal to the branch to the biceps) were evaluated. Detailed electrophysiologic studies and MR imaging of the affected limbs were performed to study the innervation (and denervation) of the brachialis muscle. In these three patients, preoperative and intraoperative electrophysiologic studies and MR imaging demonstrated a dual innervation to the brachialis muscle by the musculocutaneous and radial nerves. The two patients with radial nerve lesions showed denervation (i.e., fibrillation potentials on EMG and signal changes in muscle on MR imaging) in the inferolateral segment of the brachialis and normal findings in the other portion of the muscle. In contrast, the patient with the musculocutaneous nerve lesion had normal findings in the inferolateral segment of the brachialis and abnormal findings in other portions of the muscle. Ip and Chang (1968) and Mahakkanukrauh and Somsarp (2002) provided important detailed anatomic data describing the dual innervation of the brachialis muscle. This recent latter study found the musculocutaneous nerve innervating the brachialis in 100% of specimens and the radial nerve providing a dual supply in 81.6%. The radial nerve supplied the inferolateral segment of the brachialis muscle. Our studies confirm the anatomic observations of others demonstrating a relatively consistent motor contribution to the brachialis muscle from the radial nerve. This dual innervation of the brachialis muscle is of clinical importance to those performing and interpreting EMG and imaging studies.

SPITZER, Gregory M\*, David RUBINSTEIN\*, John DEUTSCH<sup>1</sup>\*, Chris LEE\*, Karl REINIG\*, and Victor SPITZER. Center for Human Simulation, University of Colorado School of Medicine, Aurora, CO, and <sup>1</sup>St. Mary's/Duluth Clinic, Duluth, MN. [The Interactive Atlas: an on-line resource for arbitrary oblique, labeled atlas slices from the Visible Human male.](#)

The Interactive Atlas is a unique resource for providing labeled anatomic cross-sections at user-defined angles from the Visible Human male. The site provides models of organs and structures to facilitate navigation and placement of a cutting plane. A labeled

## Abstracts

cross-section corresponding to the cutting plane is returned from our server at the Center for Human Simulation. The cross-section is presented with roll-over labels and a measuring tool. This arbitrary-oblique cross-section can be saved as a JPEG image. Additionally, The state of the models and placement of the cutting plane can also be saved to facilitate recall and communication with students and colleagues. The application requires GL4Java to manipulate the models and cutting plane and a link for installation of this extension is provided. This application was originally built for our GI colleagues to provide atlas correlations for endoscopic ultrasound images. It has since been used for correlation of other cross-sectional imaging modalities including both intra- and extra- corporal ultrasound. The Interactive Atlas has also been utilized as the foundation for a media rich, case-based, online journal, the Visible Human Journal of Endoscopy (VHJOE) <http://www.vhjoe.org>. The Interactive Atlas (previously called the oblique maker, can be freely accessed at [www.visiblehumanexperience.com](http://www.visiblehumanexperience.com). (This project has been funded in part with funds from AstraZeneca and Touch of Life Technologies, sponsors of the University of Colorado Center for Human Simulation.)

SPITZER, Victor M., Donald P. JENKINS<sup>1</sup>, David G. WHITLOCK, Gregory M. SPITZER\*, Helen PELSTER\*, Chris LEE\*. Dave RUBINSTEIN\*, Lara REIGLER\*, Patrick SMYTH\*, Richard DOYLE\* and Ann SCHERZINGER\*. Center for Human Simulation, University of Colorado School of Medicine, Aurora, CO, and <sup>1</sup>The National Library of Medicine, Bethesda, MD. The functional anatomy of the Visible Human: Volume I, the head and neck.

A website was constructed for the purpose of illustrating some of the functional anatomy of the head and neck. The website is based on the Visible Human data from the National Library of Medicine. The site includes a common template format that facilitates its extension to the whole body. The site is dynamically constructed and permits updates and additions without interruption to the site. Two of the unique features of this site are the functional anatomy and the structure hierarchy and linkage. An example of the functional anatomy is a unique demonstration of medial/lateral jaw motion as a result of unilateral contraction of the lateral pterygoid muscles. The structure hierarchy and cross linkage provides a common format database of relational anatomy. Each structure in the listing is tied to a model viewer and to the latest research relating to the structure (as provided by Pub Med). Head and Neck functions included on the site are: mastication, facial expression, deglutition, phonation, hearing

## Abstracts

and ocular motion. Each of these six functions is broken down into sub-functions (when appropriate) and illustrated with both clinical and surgical cases that demonstrate the anatomy involved in the functions. Access to the website is free at <http://vhhn.visiblehuman.org>. (This project has been funded in part with funds from the National Library of Medicine, National Institutes of Health, under Contract No. N01-LM-9-3527.)

SPITZER, Victor, Gregory SPITZER, Lee GRANAS, and David WHITLOCK. University of Colorado Center for Human Simulation, Aurora, CO. Correlated one, two and three-dimensional anatomy. Understanding multi-dimensional anatomy has become a clinical necessity. Consequently, these needs must be addressed in the formative years of medical education. Students must learn how to interpret anatomy from different views as well as understand its structure and function. The Visible Human and tools developed to interact with it, provide an ideal platform for students to learn from in both their formative years and throughout their careers. Some of these tools, in use at the University of Colorado School of Medicine, include a web-based tool, the Interactive Atlas which provides a complete two-dimensional reference atlas. Another tool, The Functional Anatomy of the Visible Human: Volume 1 Head and Neck includes resources for aiding in the understanding of two and three-dimensional anatomy. A final and more comprehensive tool, the VH Dissector, incorporates aspects of these two websites and adds other functionality to allow the student to explore the entire human body in one, two and three-dimensions. The VH Dissector Pro includes all of the full-resolution cross sections of the Visible Human Male and three-dimensional renderings of more than 2,000 dissectible, anatomic structures.

STEWART<sup>1\*</sup>, LynseyTara, ORLANDO<sup>1\*</sup>, and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, Harvard Medical School, Boston, MA. The location and the morphology of the celiac ganglion.

Fifty dissections of the celiac ganglion (CG) were performed in formalin fixed cadavers in order to identify the morphology, the location and the nerve connection that the ganglion receives. CGs appeared as two separated square structures in 16% of the cases while, in the remaining 84% cases the CG appeared to be as a bilobed mass of tissue. From the 84% (50) cases of fused CGs, 45 exhibited an aorticorenal ganglion while in the remaining 5 CG and aorticorenal ganglia were fused. Same was true for the superior

## Abstracts

mesenteric ganglion. In 25% of the cases the CG had a horseshoe appearance surrounding the superior mesenteric artery and celiac ganglion. Posterior vagal trunk was identified in all dissections and was connected with multiple nerve fibers at the upper pole of CG. The lateral pole was receiving connections from the greater splanchnic nerve in 80% of the cases. In the remaining 20% of the cases, the greater splanchnic nerve was connected with the aorticorenal ganglia. The width of the celiac ganglia varied considerably and it was associated with the nerve connection with and from the surrounding ganglia. We believe that the CG most of the times is one ganglion structure and inability of fusion of the medial sides produces two CGs. This study reinforces the need for more studies to the area in order to explore the communication patterns between the CGs.

STIEGLER\*<sup>1</sup>, Travis, Matthew GROBER\*<sup>2</sup> and Ann POZNANSKI<sup>1</sup>.  
<sup>1</sup>Midwestern University, Glendale, AZ; <sup>2</sup>Georgia State University, Atlanta, GA. An examination of arginine vasotocin expression in sensory structures of zebrafish, *Danio rerio*, embryos.

In the course of immunocytochemical examination of AVT peptide expression on paraffin-sectioned brains of zebrafish, we made the observation that AVT appeared to be present in sensory structures of developing embryos, including the olfactory epithelium, taste buds and lateral line neuromasts. This novel observation has potential relevance to the process by which AVT regulates the production of sexual behavior in a variety of non-mammalian vertebrates. In order to confirm that the observed staining was specifically due to the presence of AVT, we used a synthetic AVT peptide to block the primary anti-AVT antibody. Our positive control was staining with antibody on sections of adult zebrafish brains, where we have previously confirmed the recognition of AVT by this antibody. Our negative control was the lack of staining in brain tissue when anti-AVT is preabsorbed overnight with synthetic AVT peptide. We found that the same sensory structures stained positive in embryos with both the blocked and unblocked antibody. By this comparison, we determined that the polyclonal anti-AVT antibody could be binding to either an antigen other than AVT, or to an epitope on the AVT peptide or AVT preprohormone that is not blocked by specific AVT preabsorption. Ongoing experiments are being performed to identify the protein that is recognized by the polyclonal antibody, using western blot followed by gel band isolation and peptide sequencing.

## Abstracts

STEIN, Pamela A\* and Jennifer K BRUECKNER. Anatomy and Neurobiology, University of Kentucky, Lexington, KY. A multimedia-based teaching tool for the clinical anatomy of oral local anesthesia. Learning the art and science of oral local anesthesia is extremely important for dental students. Before beginning their course in local anesthesia, students must have a solid understanding of the anatomy of the head, including neuroanatomy, vascular anatomy, muscle and bony landmarks. We are developing a multimedia tutorial using Macromedia Director 8.5 designed to review the most relevant anatomy with the student before and during their course in anesthesia. A national survey of local anesthesia course directors indicates a need for such a tool. The program will guide students through common oral injections on a cadaver and a dry skull, demonstrating the appropriate landmarks for initial needle placement, the structures the needle passes through and finally the target site for the needle. The target branch of the trigeminal nerve will be exposed and a review of the structures innervated by these branches will follow. Structures surrounding the target nerves, such as branches of the facial nerve, arteries and the pterygoid plexus will be demonstrated to show the student how a misplaced injection can cause complications. This software promotes improved preparation for local anesthesia course work and should ultimately enhance the student's ability to successfully anesthetize patients.

SUBRAMANIAM, Krishnan. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur. Position of the mental foramen in an Asian population.

Knowledge of the position of the mental foramen is essential for designing muco-periosteal flaps, securing anaesthesia and for differential diagnosis of periapical lesions in dentistry. A total of 400 full dentition panoramic radiographs of adult Malay (200), Chinese (150) and Indian (50) patients were evaluated on the right (R) and left (L) sides. The number of radiographs selected for each ethnic group was proportionate to the general population in Malaysia. The locations of the foramina were categorized as follows: (i) anterior to first premolar tooth (R - 0%; L - 0%); (ii) at apex of first premolar tooth (R - 2%; L - 1.5%); (iii) between the apices of the lower premolars (R - 21%; L - 20%); (iv) at apex of second premolar (R - 49%; L - 50.5%); (v) posterior to second premolar (R - 22.5%; L - 24%) and (vi) below the apices of the first molar (R - 5.75%; L - 4.0%). There was no difference between sides ( $p > 0.1$ ) or between the ethnic groups ( $p > 0.1$ ). Knowledge of the variability in position of the mental foramen can greatly assist in the design of muco-

## Abstracts

periosteal flaps particularly around the lower premolar region. This will also help in identification of the mental neurovascular bundle.

SWARTZ<sup>1\*</sup>, Brandon and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard Medical School, Boston, MA. Veins of Retzius, an anatomical study.

The aim of this study was to identify and classify the veins of Retzius (VR) in cadavers with and without portal hypertension. For this reason we studied 90 cadavers without portal hypertension and 10 cadavers with portal hypertension. The pathways of the VR were classified as follows: Type I (100): all specimens presented with very small veins from the lateral sides of the abdominal wall connecting to the IVC. Type II (34): the right gonadal vein drained into IVC. Type III (5): the iliocolic vein drained into the IVC. Type IV (54): the iliocolic vein drained into the right renal vein. Type V (5): the iliocolic vein drained and the right gonadal vein. Type VI (13): the pancreaticoduodenal vein drained into the IVC. Type VII (10): the superior mesenteric vein drained into the left gonadal vein. The 10 cadavers with portal hypertension did not differ from this classification. However, the caliber of the veins was 3 to 5 times greater than the normal. Knowledge of this vascular anatomy is of clinically important especially to radiologist examining patients with portal hypertension.

TALARICO<sup>1</sup>, Ernest F. and James J. WALKER<sup>2,3</sup>, <sup>1</sup>Northwest Center for Medical Education and <sup>2</sup>Lafayette Center for Medical Education, Indiana University School of Medicine and <sup>3</sup>Purdue University, IN. Introduction to the cadaver experience: a multimedia program for use in a gross anatomy course.

Anatomy students are often anxious about using cadavers for the first time. In an effort to alleviate some of this anxiety, we have developed a multimedia presentation (CD-ROM) focused on a variety of issues related to the use of human cadavers in the gross anatomy laboratory. The topics addressed in this program include: (1) the donation process; (2) dissection techniques; (3) logistics of the anatomy laboratory; (4) care of the cadaver specimen; (5) rules & safety in the laboratory, and; (6) memorial service. Contributors to the project included potential willed body donors, medical students, and professional anatomists. The presentation included multimedia such as text slides, static images, as well as audio and video clips. The format was designed to be adaptable to fit diverse instructor and/or student needs. Our medical students viewed the presentation

## Abstracts

during orientation and were asked to complete a short survey evaluating the effectiveness of the program. The results of the survey indicated a very favorable response to the quality of the presentation and its usefulness as a teaching resource and it was highly recommended to other students. The goal of this project was to create an interactive learning resource that will serve the national/international medical community.

TONGSON<sup>1\*</sup>, Jon, and Marios LOUKAS<sup>1,2</sup>. <sup>1</sup>Department of Anatomy, American University of the Caribbean, Saint Maarten, NA, <sup>2</sup>Harvard Medical School, Boston, MA. The clinical significance of crista terminalis.

Crista terminalis (CT) is a very important landmark due to the passage of the SA node artery to the SA node. However, the gross anatomy of the CT as well as the pectinate muscles (PM) originating from it is not described in the literature. Therefore, the aim of our study was to investigate the detailed anatomy of CT and its junctional regions with the PM and intercaval area. For this reason, we examined 300 adult human hearts. The dimensions of the CT were measured in width and thickness from epicardium to endocardium. The PM originated from the crest and extended along the wall of the appendage towards the vestibule of the tricuspid valve. We were able to classify the course of the PM and the course of the most prominent PM, the Tenia Sagittalis, into 6 and 3 different types respectively. Type I (15%): TS was absent, Type II (65%): TS was single and Type III (20%): multiple TS were present. Furthermore, the course of PM was classified into 6 types. Type I (40%): PM oriented perpendicular to the CT with uniform spacing and lack of crossover (trabeculation). Type II (20%): non-uniform PM organized in a haphazard, trabecular fashion with numerous crossovers. Type III (15%): PM with uniform spacing and no trabeculation with fibers oriented parallel to CT, Type IV (10%): arborizing PM originating from a common muscle trunk (solitary trunk). Fibers oriented both perpendicular and parallel to CT, Type V (10%): similar architecture to Type III, but with more than one common muscle trunk, Type VI (5%): Prominent muscular column with velamentous PM imparting potential implications in cardiac catheterization procedures.

TUBBS, R. Shane, E. George SALTER, James SHEETZ, Steven ZEHREN, Donald H. LEE\*, Jean OAKES\*, and W. Jerry OAKES\*. Departments of Cell Biology, Orthopedics, and Division of Neurosurgery, University of Alabama at Birmingham, Birmingham,

AL. A novel surgical approach to the carpal tunnel: a cadaveric feasibility study.

Carpal tunnel syndrome is the most common entrapment neuropathy dealt with by the clinician. Multiple techniques have been used to surgically treat this pathological condition and all of these approach the carpal tunnel from the palmar surface of the hand or wrist. We have developed a novel endoscopic approach to the carpal tunnel utilizing a dorsal approach which necessitates a good appreciation of the anatomy of this region. This approach was performed in ten hands. Through a single dorsal incision we were able to transect the flexor retinaculum in all specimens without obvious damage to neural or vascular tissues. Our dorsal approach with visualization of the internal aspect of the flexor retinaculum may obviate many of the complications that are seen with the current techniques used to surgically treat carpal tunnel syndrome such as injury to the median nerve and its branches. Clinical trials are now necessary with prospective randomized studies that will determine which techniques are most efficacious and minimize complications most effectively.

ÜZEL<sup>1</sup>, M. v. LÜDINGHAUSEN<sup>2</sup>. <sup>1</sup>Department of Anatomy, University of Istanbul, Cerrahpasa, K.M. Pasa-Istanbul, TURKEY. <sup>2</sup>Institute of Anatomy and Cell Biology, University of Würzburg, Würzburg, GERMANY. The arterial supply of the interventricular septum of the human heart.

This study was designed to determine the pattern of arterial supply of, and arterial preponderance in, the human interventricular septum (IVS). One hundred human heart specimens (84 cadaveric specimens and 16 corrosion casts) were studied macro-anatomically. The coronary arteries were injected barium sulphate and red resin in 20 specimens. In 38 specimens intramural courses of the septal arteries were exposed; 8 radiographs of the IVS were made. The IVS was divided into superior and inferior parts; each of which further divided into anterior, middle and posterior parts; additionally an apical section was determined. First extramural portions of the septal arteries were exposed and then intramural courses were traced. All septal branches derived from arteries of the coronary and interventricular sulci of the heart. In 15 cases a few or all septal arteries were not visible on the surface of the heart because they were covered by myocardial bridges. In general there was a left dominance of arterial supply of the IVS, because the anterior and apical septal branches of the anterior interventricular artery (AIA) were frequent and strong. The strongest septal branch was the anterior descending septal artery (ADSA) or main septal

## Abstracts

artery (MSA) (N = 72 cases). The mean length of its extra- and intramural stem was 16 mm. Intramurally it bifurcated into superior and inferior branches which supplied the middle superior and middle inferior sections of the IVS. In 15 cases we found instead of an ADSA two or three smaller anterior septal branches of similar strength and length (N = 9). A terminal twig of the inferior branch of the ADSA supplied the moderator band and even the anterior papillary muscle; however, there were cases exhibiting accessory branches directly deriving from the AIA or further septal branches (N = 4). The left superior septal artery (LSSA) was emerging from the AIA and supplied the anterior superior section of the IVS; however, it did not always exist. In 3 cases there was a right dominance of the arterial supply of the IVS. In these cases the right superior septal artery (RSSA) deriving from the stem of the right coronary artery (RCA) was rather strong and supplied the middle superior section of the IVS. In some cases it was longer and reached and supplied even the moderator band and anterior papillary muscle. In 5 cases there was a balanced type of arterial supply of the IVS. There was a crossing manoeuvre of terminal branches of the ADSA and RSSA which were of equal size. The posterior septal arteries derived from the posterior interventricular artery (PIA) and supplied the posterior superior and posterior inferior sections of the IVS. In a few cases some posterior septal branches derived from the right marginal artery. The apical section was supplied by apical branches from the AIA. In 92 cases there was a left coronary dominance of the IVS because the ADSA and further anterior septal arteries were the main supplier; in 5 cases there was a balanced type of IVS supply because both ADSA and RSSA were equal in size and length; in 3 cases there was a right coronary dominance of the IVS because the RSSA was the main supplier of the IVS.

VILENSKY, Joel A. Department of Anatomy and Cell Biology, Indiana University School of Medicine, Fort Wayne, IN. Sir Felix Semon and Semon's Law.

Semon's law refers to the tendency of the abductor muscles of the vocal cords to become affected sooner than the adductor muscles in peripheral or central lesions affecting the roots or trunks of the vagus, spinal accessory or recurrent laryngeal nerves. Although this law is not uniformly accepted, it is generally regarded as true and has had various explanations since Semon first proposed it in 1881. Semon tried to understand the neurophysiological basis of the law by investigating the motor control of the larynx in studies with Victor Horsley, who is usually considered the "father of modern

## Abstracts

neurosurgery." Semon suggested that the adductor motor centers have more "mutual cooperation and anatomical connections" than the abductor centers. This, he believed, offered the adductor centers better protection against disease. Since Semon's original explanation additional reasons have been suggested to explain the phenomenon such as the action of the cricothyroid muscle, spontaneous reinnervation from other nerves (e.g., ansa cervicalis) and most recently, simultaneous contraction of antagonistic muscles. Semon was a pioneer in the field of laryngology who treated many of the luminaries of his day including William Gladstone, Queen Victoria and King Edward VII. Both his life and work are of interest to anatomists.

WARD<sup>1</sup>, Peter J., and James J., WALKER<sup>1,2</sup>. <sup>1</sup>Department of Basic Medical Sciences, Purdue University, IN and <sup>2</sup>Lafayette Center for Medical Education, Indiana University School of Medicine. A qualitative characterization of the learning strategies used by successful and veterinary students in a first year gross anatomy course.

The gross anatomy laboratory is a common learning environment for medical and veterinary students. The success of professional students is dependent upon their ability to develop effective learning strategies leading to long-term recall of anatomical information. We used qualitative methods to assess the learning strategies of first-year veterinary students to determine which approaches correlated with greater success during a first semester gross anatomy course. Students' responses to a questionnaire were used to identify specific individuals in the upper and lower fifths of the class. A more in-depth analysis was then conducted with these students using classroom observations and personal interviews. The results thus far, show that both sets of students used a wide variety of active (dissection and models) and passive (listening to lectures) learning strategies, but the successful students tended to apply the learning in various contexts and strove for a deeper understanding of function. The less successful students focused more superficially on the names of anatomical structures without understanding their underlying significance. These results demonstrate that successful anatomy education is associated with moving beyond recognition and memorization to a deeper understanding of anatomical concepts. Studies are currently underway to investigate the connections between learning strategies and long-term recall.

## Abstracts

WEIGLEIN<sup>1</sup>, Andreas, C. SCHALK\*<sup>1</sup>, B. MORIGGL<sup>2</sup>, K.H. KÜNZE\*<sup>2</sup>, U. MÜLLER\*<sup>3</sup>. <sup>1</sup>Institute of Anatomy Medical University Graz, <sup>2</sup>Institute of Anatomy Innsbruck, AUSTRIA, <sup>3</sup>Anatomische Anstalt, Munich, GERMANY. The arteries in the posterior cervical triangle in man.

Due to frequent changes of the anatomical nomenclature of the arteries in the posterior cervical triangle [lateral cervical region], anatomical and surgical papers relating to these topic are sometimes difficult to understand and hardly comparable. Problems due to both knowledge of proper gross anatomy and nomenclature of the arteries in the posterior cervical triangle have culminated in problems in flap planning mostly in plastic and reconstructive surgery. Particularly the term transverse cervical artery (A. transversa colli [cervicis]) is used with different meanings. To obtain an overview of the arteries of the neck and their origin, a total of 249 human cadavers (498 neck-halves) were investigated in Graz, Innsbruck and Munich. Based on the findings of this study we used the following nomenclature: As the superficial cervical artery the dorsal scapular artery, and the suprascapular artery form various trunks, we decided to call these trunks according to other trunk-formations (e.g.: linguofacial trunk) and omit the term transverse cervical artery. A cervicodorsal trunk formed by the superficial cervical artery and the dorsal scapular artery was found in 30 %. A cervicoscapular trunk formed by the superficial cervical artery and the suprascapular artery was found in 22 %. A dorsoscapular trunk formed by the dorsal scapular artery and the suprascapular artery was found in 4 %. A cervicodorsoscapular trunk formed by the superficial cervical artery, the dorsal scapular artery and the suprascapular artery was found in 23 %. Each of these trunks arise either from the subclavian artery or the thyrocervical trunk.

ZAHOI, D. Delia Elena\*, Petru L. MATUSZ, Agneta Maria C. PUSZTAI\*, Mioara V. FARCA URECHE\* and Dorina V. SZTIKA\*. University of Medicine and Pharmacy "Victor Babes", Department of Anatomy, Timisoara, ROMANIA. Specific aspects of the renal parenchyma drainage in the case of a single renal vein. Study on corrosion casts.

The venous segmentation of the renal parenchyma was described by Di Dio in 1956, then by GRANDE in 1968. Because of the often anastomoses between the tributaries of the renal vein the notion strict of venous renal segment has to be replaced with predominant drainage territory. There are very few recent studies that could analyze the venous renal drainage. There have been selected 200

## Abstracts

corrosion casts with a single renal vein. They were created by the injection with plastic mass of the renal vasculo-ductal systems, followed by the corrosion of the renal parenchyma with hydrochloric acid. The analyze of the venous drainage of the 200 corrosion casts that in 54% (108/200) there exist four predominant drainage territories. Among these, 80,56% (87/108) present the territories: anterior, superior, posterior and inferior (aspect of equilibrated venous drainage). A peculiar aspect was the absence of the prepyelic vein in 6% of the cases (12/200) and that of the retropyelic vein in 26,50% (53/200). In these cases, the venous flux traverse the pyelo-calyceal plane in order to drain in the present venous trunks. The knowledge of these morphological aspects of venous drainage can ease the planning and the realization the surgical interventions concerning the partial renal resection.

ZAHOI, Delia Elena D.\*, Petru L. MATUSZ, Dorina V. SZTIKA\*, Agneta Maria C. PUSZTAI\*, and Mioara V. FARCA URECHE\*. University of Medicine and Pharmacy "Victor Babe\_", Department of Anatomy, Timi\_oara, ROMANIA. Morphological consideration concerning the penetration of the multiple renal arteries in the parenchyma. Study on corrosion casts.

The renal arteries present a great morphological variability either the branching manner or the number and the intraparenchymatous arrangement. The penetration manner of the multiple renal arteries represents an aspect less investigated. There have been selected 42 casts with multiple renal vein from 200 corrosion casts. They were created by the injection of the renal vasculo-ductal systems with plastic mass, followed by the corrosion of the renal parenchyma with hydrochloric acid. The analysis of the penetration manner of the multiple renal arteries in the renal parenchyma reveals that: \_ the superior renal artery penetrates in the great majority of the cases through the hilum (52,38% - 22/38 casts) and in 38,09% of the cases (16/38 casts) the penetration is extrahillary – with aspect of polar superior artery with the origin in the abdominal part of the aorta; \_ the middle renal artery penetrates in the renal parenchyma always at the level of the hilum (100% - 4/4 casts); \_ the inferior artery penetrates in the hilum only in 7,14% of the cases (3/38); in the majority of the cases taken in the study (35/38 – 83,33%) it penetrates extrahillary in the parenchyma, with an aspect of polar inferior artery. These morphological aspects have to be known and taken in consideration in the case of planning renal transplantation.

## Abstracts

ZURADA\*, Anna, and Jerzy St. GIELECKI\*. Department of Anatomy, Silesian Medical University, POLAND. (Sponsored by B. R. MacPherson) Interactive virtual reality 3D visualization of the circle of Willis using CT angiography.

The interactive virtual reality (IVR) system based on cerebral CT angiography (CTA) opens up new possibilities for the preoperative planning of neurosurgical procedures as well as, for the preoperative information of the patient. Original software GAIDA (Gradual Angiographic Image Data Analyzer) based on AVS Express platform was used for IVR tree-dimensional (3D) presentation both the base of skull and CTA. IVR system was able to performed many projections for studying relations of various skull landmarks (processes, grooves, canals) and cerebral arteries. GAIDA software for the three-dimensional reconstruction of CT-image data permits to reconstruct of natural size of segments of the circle of Willis thus enabling preoperative measurements of relevant parameters (diameter, length, volume, angles, distances, area). Using IVR system several distances between points of the skull base and segments of the circle of Willis were identified and measured. These studies provide new insight into the relations of the circle of Willis and various parts of the skull base and can be used for better understanding of the stereoscopic topography of the cerebral arteries. The IVR techniques described allow for new perspectives in preoperative planning and performing neurosurgical procedures.

*We hope to see you next year at the joint  
AACCA/BACA meeting in New York City*

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