

AMERICAN ASSOCIATION OF CLINICAL ANATOMISTS



**The object of this 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**

AMERICAN ASSOCIATION OF CLINICAL ANATOMISTS



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CLINICAL ANATOMY

Official Journal of the
American Association of Clinical Anatomists and the
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THURSDAY JULY 10, 1997

ANNUAL BANQUET

Presentation of Honored Member Award

to

Tatsuo Sato, M.D.

**Regent Ballroom Hawaiian Regent Hotel
Honolulu, Hawaii**

6:30 pm Cash Bar

7:00 Entertainment

7:30 Dinner

8:00-9:30 Annual Banquet,

**Presentation of Honored Member Award to Tatsuo Sato, M.D. Ph.D.
Professor of Anatomy and Head Second Department of Anatomy,
Dean, Faculty of Medicine Tokyo Medical and Dental University.**

The \$150 registration fee paid by members includes the cost of the Scientific Program and the Banquet. The spouse or guest of the registrant is welcome to attend the banquet, \$40.00,

Honored Member 1997



Tatsuo Sato, M.D. Ph.D.

Anatomist * Scholar * Educator * Administrator

For his distinguished career in clinically-applied anatomy, his meticulous demonstration of human anatomy, and in appreciation of his participation in, support of, and service to the AACA and the journal, CLINICAL ANATOMY.

Previously Honored Members:

W. Henry Hollinshead, 1984	Frank H. Netter, 1990
Chester B. McVay, 1985	Ralph Ger, 1991
Donald James Gray, 1986	M. Roy Schwarz, 1992
Russell T. Woodburne, 1987	Carmine D. Clemente, 1993
Oliver Beahrs, 1988	Keith L. Moore, 1994
N. Alan Green, 1989	Ray J. Scothorne 1995
	Robert A. Chase 1996

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Generous donations and/or commercial exhibitor fees paid by the following companies and organisations have substantially reduced the Association's expenses in presenting this meeting. You are encouraged to visit the exhibits available for viewing in the Diamond Head Ballroom. Please refer to your registration packet for an up-to-date listing, including sponsors who have registered after the date of this printing.

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Tuesday, July 8, 1997

PRELIMINARY EVENTS

All Tuesday events at the Hawaiian Regent Hotel: Check events board to confirm meeting rooms

- 8:00 am** **Journal Committee – (*for Committee members*)**
Kukui Room
- 9:00- 5:00 pm** **Executive Council Meeting**
(for AACA Officers and Councilors). Kukui Room
- 5:30 p.m.** **Registration and Check-in. *Hawaiian Regent Lanai***
- 6:00-8:00 p.m.** **Welcome Reception - (cash bar) -- for all meeting attendees**
and their accompanying persons.
Ocean Terrace

Wednesday, July 9, 1997

Scientific Program*

**The Creighton University School of Medicine designates this CME activity for a total of 14 credits in Category 1 of the Physicians Recognition Award of the American Medical Association.*

This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education through sponsorship of Creighton University School of Medicine and the American Association of Clinical Anatomists in co-operation with the John A. Burns School of Medicine, University of Hawai'i at Mānoa. The Creighton University School of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

All Events at the Hawaiian Regent Hotel

Scientific Platform Sessions - The Hawaiian Ballroom

Continental Breakfasts/Posters/Demonstrations/Commercial Exhibits - Diamond Head Ballroom

- 7:00- 8:30 am **Editorial Board Breakfast Meeting**
*(for Editors and Associate Editors
of CLINICAL ANATOMY),
hosted by John Wiley & Sons, Inc.*
- 7:30 **Registration and Continental Breakfast**
Posters/Demonstrations/Commercial Exhibits
Diamond Head Ballroom
- 8:45 **Opening Ceremonies/Remarks: Peter C. Amadio, M.D.,**
President AACA, Sherrel L. Hammar, M.D., Interim Dean,
John A. Burns School of Medicine,
University of Hawai'i at Mānoa.

Announcements: Marita Nelson, Ph.D., Local Host

Wednesday, July 9, 1997

Platform Session I: Head and Neck

Moderator: Scott Lozanoff

- 9:00 The skeletal and microvascular pathology of the middle ear in osteopetrotic (tl) rats and its improvement after CSF-1 treatment. AHARINEJAD, Seyedhossein, Peter FRANZ*, Wilhelm FIRBAS and Sandy C. MARKS Jr. Departments of Anatomy and ENT, University of Vienna, Austria, and of Cell Biology, University of Massachusetts Medical Center, Worcester, Massachusetts, USA.
- 9:15 The masseteric nerve. A possible donor for facial nerve anastomosis? (preliminary report). BRENNER*, Erich and Thomas SHOELLER*, Institute of Anatomy and Clinics for Plastic and Reconstructive Surgery, University of Innsbruck, Austria (sponsored by S. POISEL).
- 9:30 Radiologic anatomy of the atlas - Diagnosis of Jefferson fractures. WEIGLEIN, Andreas H. and Heinz SCHMIDBERGER*, Anatomical Institute and Department of Radiology*, Karl-Franzens-University Graz, Austria.
- 9:45 Deformations of the midfacial complex in subjects with Class III malocclusions: thin-plate spline analysis. SINGH¹, Gurdev D., James A. McNAMARA JR.*, and Scott LOZANOFF². ¹Dept. of Dental Surgery, University of Dundee, Scotland, UK, *Dept. of Orthodontics, University of Michigan, Ann Arbor, Michigan USA, and ²Dept. of Anatomy, University of Hawaii, Manoa, Hawaii, USA.
- 10:00 An anatomical description of the mastoid canals. DIMOPOULOS*, Chris and Marios LOUKAS* Department of Human Anatomy Warsaw Medical School and Department of Applied and Clinical Physiology Warsaw Medical School, Warsaw, Poland (sponsored by D.O. Graney).
- 10:15 Anatomical study of vascularized bone grafts for mandibular reconstruction. OHNO, K., H. SHIMA, K. MICHI, K. EGASA*, I.L. TAKIGUCHI*. First Department of Oral and Maxillofacial Surgery, First Department of Oral Anatomy, School of Dentistry, Showa University, Tokyo, Japan

Wednesday, July 9, 1997

10:30

Refreshment Break
Posters/Demonstrations/Commercial Exhibits
Diamond Head Ballroom

POSTER SESSION I: All posters listed below will be on display throughout Wednesday, 7:30 am – 8:00 pm Adjournment. Except for the afternoon adjournment, authors should staff their posters during poster display periods

Accessory soleus muscle. AGUR, Anne, Nancy McKEE* and Roger LEEKAM*. Departments of Anatomy and Cell Biology, Surgery and Medical Imaging, Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada.

Preliminary anatomic evidence of partitioning in the human brachialis muscle. BAKKUM*, Barclay W. Department of Anatomy, The National College of Chiropractic, Lombard, Illinois (sponsored by G.D. CRAMER).

Endangering of the Ramus medialis rami dorsalis nervi spinalis by the dorsal approach to the thoracolumbar spine. BOELDERL, Andreas*, Herwig DANIAUX*, Anton KATHREIN* and Herbert MAURER*, Department of Trauma Surgery and Institute of Anatomy, University of Innsbruck, Innsbruck, Austria (sponsored by S.POISEL).

Observations on cervical vertebral motion segments in aged cadavers. BRIGGS, Christopher A. and Seba CHANDRARAJ, Department of Anatomy & Cell Biology, University of Melbourne, Parkville, Victoria, Australia, and Department of Anatomy & Physiology, RMIT, Bundoora, Victoria, Australia.

Case-based learning in gross anatomy: initial impressions. CASEY, Michael A., and James H. SHEETZ. Department of Cell Biology, University of Alabama School of Medicine, University of Alabama at Birmingham, Birmingham, Alabama, USA.

Accuracy of cricothyroidotomy in ATLS training. CASTILLO, Manuel H. and Mark RANZINGER*, Wright State University, School of Medicine, Department of Surgery, Dayton, Ohio, USA.

Wednesday, July 9, 1997

POSTER SESSION I: (Continued)

Male rhabdosphincter - Morphology, blood supply and clinical relevance
COLLESELLI, K., A. STENZL, R. TOEREK, S. POISEL, H. STRASSER, and
G. BARTSCH. Institute of Anatomy and the Department of Urology, University
of Innsbruck, Innsbruck, Austria

Carnegie embryo computer models and the emulation of embryonic development.
DISCHER* William F. and Elizabeth C. LOCKETT. Human Developmental
Anatomy Center, National Museum of Health and Medicine, Armed Forces
Institute of Pathology, Washington, DC, USA (sponsored by Dr. Adrienne NOE).

Pancreatic mucinous ductal ectasia: Precursor of malignancy and relationship to
chronic pancreatitis. DOERR, Ralph J., Carmine M. VOLPE*, Mahmoud N.
KULAYLAT*, and Edward L. BRADLEY III*. State University of New York at
Buffalo, Buffalo, New York, USA.

ICAM-1 distribution on choroid plexus, arachnoid membrane and dural sinus of
rats: Analysis with immuno SEM and TEM. ENDO*, Hiroshi, Katsunori SASAKI,
Akira TONOSAKI* and Takamasa KAYAMA*¹). Department of Anatomy, and
¹Neurosurgery, Yamagata University School of Medicine, Yamagata, Japan.

Dural vessel endothelial cell anionic sites and neurogenic inflammation: a
preliminary assessment. GHABRIEL*, Mounir N., Meng Xiang LU*¹, Chris
LEIGH*¹ and Gerry ALLT*², Department of Anatomy, University of Adelaide,
South Australia¹, Australia and Institute of Neurological Studies, University
College London, UK² (sponsored by P. H. Abrahams).

Anatomical and statistical study. Huayue CHEN*, Shoichi EMURA*, Akira
TAMADA*, Tomo YAMAHIRA*, Kishiko TERASAWA*, Marjan JAMALI*, Hideo
ISONO and Shizuko SHOUMURA. Department of Anatomy, Gifu University
School of Medicine, College of Medical Sciences Gifu University and Heisei
College of Medical Technology, Gifu, Japan.

The Extensor digitorum brevis manus enters into the Aponeurosis dorsalis
digitorum manus of the third digit. HIGUCHI*, Katsura., and Kunio KOHNO*.
Department of Anatomy, University of Tsukuba, Institute of Basic Medical
Sciences, Tsukuba, Ibaraki, JAPAN (sponsored by T. SATO).

Wednesday, July 9, 1997

POSTER SESSION I: (Continued)

Relationship between sympathetic trunk and inferior thyroid artery.

HIRATA, Kazuaki, Department of Anatomy, St. Marianna University School of Medicine, Kawasaki, Japan. (sponsored by: D. O. Graney)

Asymmetry in the mandibular condyles of individual subjects. JERGENSON, Margaret A. and John M. BARTON*. Department of Oral Biology, Creighton University School of Dentistry, Omaha, Nebraska.

The contribution of plastination techniques to neuroanatomy teaching. JONES, D. Gareth and Russell J. BARNETT* Department of Anatomy and Structural Biology, University of Otago, Dunedin, New Zealand.

Impedance analysis as an effective tool in the study of body fat and composition. JUDSON, John P.,* Department of Anatomy, University of Malaya, Kuala Lumpur, Malaysia. (sponsored by K. Subramaniam).

An integrated course in introductory clinical skills and clinical anatomy for first-year medical students. KASUYA, Richard T., M., Marita NELSON, and John MELISH, Department of Medicine and Department of Anatomy, University of Hawaii John A. Burns School of Medicine, University of Hawaii at Mānoa, Honolulu, Hawaii, USA

Surgical anatomy of the upper cervical spine in regard to C1/C2 transarticular screw fixation in trauma- or orthopedic cases. KATHREIN, Anton*, Andreas BOELDERL*, Thomas KLESTIL*, Herwig DANIAUX* and Walter RABL*+. Department of Trauma Surgery and Institute of Forensic Medicine, University of Innsbruck, Innsbruck, Austria (sponsored by S.POISEL).

Evaluation of computers in the Anatomy curriculum for first-year medical students. LAMPERTI, Albert A., Thomas A. MARINO*, and Marvin SODICOFF*. Department of Anatomy & Cell Biology, Temple University School of Medicine, Philadelphia, Pennsylvania.

Wednesday, July 9, 1997

POSTER SESSION I: (Continued)

Problem-Based Learning (PBL) strategies in a restructured Basic Science Curriculum. LEE, Robert E., John A. McNULTY*, Elaine P. LEE*, James R. KENNEDY, and M.F. DAUZVARDIS*. Department of Cell Biology, Neurobiology and Anatomy, Department of Pathology and Department of Surgery, Stritch School of Medicine, Loyola University Medical Center and Hines VA Hospital, Maywood, Illinois, USA

Students' reactions and emotions during cadaver dissection. LOUKAS* Marios and Chris DIMOPOULOS* Department of Human Anatomy and Department of Applied and Clinical Physiology Warsaw Medical School, Warsaw, Poland. (sponsored by D.O. Graney).

A dissection-based multimedia tutorial for the perineum. MacPHERSON, Brian R., David PECK, Kathryn M. WONG*, Derek EGGERS* and Duane HEADWORTH*, Department of Anatomy & Neurobiology and University Arts & Photography, University of Kentucky Medical Center, Lexington, Kentucky.

Microcirculation in synovial membranes of the talocrural joint sinew. MANOUKIAN, L. A. Department of Anatomy, Yerevan State Medical University. Yerevan, Republic of Armenia, (sponsored by D.O., Graney)

The use of plastination polymer to produce a permanent demonstration of the space defined by Scarpa's and Colles' Fascia. MARTIN, William D. and Daniel CARTER* Division of Structural Biology, West Virginia School of Osteopathic Medicine, Lewisburg, West Virginia, USA.

SURFdriver: A practical computer program for generating three-dimensional models of anatomical structures using a PowerMac. MOODY*, David, and Scott LOZANOFF. Department of Computing and Network Services University of Alberta, Edmonton, Alberta, Canada, and Department of Anatomy and Reproductive Biology, University of Hawai'i at Mānoa, Honolulu, Hawaii, USA.

The Elements of a Successful Anatomical Gift Program. NAGY, Frank*. Department of Anatomy, Wright State University School of Medicine, Dayton, Ohio, USA, (sponsored by M. Hines).

Wednesday, July 9, 1997

11:30 Presidential Presentation: The practice of surgery in the 21st century. Richard M. Satava, M.D., F.A.C.S., Col. USAMC, Associate Professor of Surgery, Uniformed Services University of the Health Sciences, Walter Reed Army Medical Center, Bethesda, MD.

12:15 Lunch (on your own)

Posters/Demonstrations/Commercial Exhibits

Afternoon Adjournment until 5:00 pm

Wednesday, July 9, 1997

Platform Session II: Upper Limb

Moderator: David Peck

- 5:00 pm Biometry of the capsular ligaments of the wrist. CANOVAS*, François JP., Didier B. LEDOUX*, François L. BONNEL, Department of Anatomy, Faculté de Médecine de Montpellier, France.
- 5:15 Round shoulders and brachial plexus compression as displayed by MRI; 3D Reformat and MRA. COLLINS, James D. and Theodore Q. MILLER*, Department of Radiological Services, UCLA School of Medicine, Los Angeles, California, USA
- 5:30 Rotator cuff tears: their incidence in human embalmed, unembalmed, and surgical specimens and an immunocytochemical comparison of torn and normal cuffs. GOODMURPHY, Craig G., Elizabeth J. AKESSON, Jill OSBORN, Vlad STANESCU, Sandra JOHNSON*, William D. REGAN*. Department of Anatomy, University of British Columbia School of Medicine, Vancouver, British Columbia, Canada.
- 5:45 Ultrasound imaging of the infraclavicular fossa and its application for regional anesthesia. KOLESNIK, Adam, Piotr M. DOBOSZ, and Dominik DOLINSKI*, Department of Pathology, The Children's Memorial Health Institute and Department of Anesthesiology, Warsaw Medical School, Warsaw, Poland.
- 6:00 Anatomy and sonography of the scapular notches. MORIGGL*, Bernhard. Institute of Anatomy, University of Innsbruck, Innsbruck, Austria (sponsored by S. POISEL).
- 6:15 The Digital Hand: an interactive multimedia courseware on the functional anatomy of the hand. NAH Seang-Hoo. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

6:30

Refreshment Break
Posters/Demonstrations/Commercial Exhibits
Diamond Head Ballroom

8:00 pm

Adjournment

Thursday, July 10, 1997

**7:30 a.m. Registration and Continental Breakfast
Posters/Demonstrations/Commercial Exhibit
Diamond Head Ballroom**

Platform Session III: Thorax and Abdomen

Moderator: Paula Hoos

- 8:15 Morphology of the atrioventricular node of the heart conducting system.** LAZAROVA* Dobrila, and Gordana PETRUSEVSKA*. Institute of Anatomy, Institute of Pathology, Medical Faculty, Skopje, Republic of Macedonia. (sponsored by D.O. Graney)
- 8:30 Clinical anatomy of the internal mammary artery - A morphologic and morphometric investigation.** PIETRASIK, Kamil, Pawel ZDUNEK*, Leopold BAKON*, Piotr M. DOBOSZ, and Adam KOLESNIK. Department of Human Anatomy, Warsaw Medical School, and Department of Pathology, The Children's Memorial Health Institute, Warsaw, Poland.
- 8:45 Histotopographic peculiarities of the changes of the gallbladder's mucous membrane microcirculatory unit in cholecystitis.** Gohar P. KYALYAN*. Department of Normal Anatomy; Yerevan State Medical University, Yerevan, Republic of Armenia (sponsored by D. O. GRANNEY).
- 9:00 The triangle of Calot is not the same as it used to be. What happened?** HIRAI*, Denitsu and R. Lisa HIRAI*. Creighton University School of Medicine, Omaha, Nebraska and University of Nebraska School of Medicine, Omaha, Nebraska, (sponsored by Tom Quinn)
- 9:15 Comparative angioarchitecture of the islets of Langerhans in vertebrates.** SAYED ALI*, S., Department of Anatomy and Cell Biology, Justus-Liebig University, Giessen, Germany, (sponsored by D.O. Graney).
- 9:45 Video demonstration of a detailed dissection of the abdominal paraaortic lymphatics.** TSUBOI*, Yoko, Sadaaki HEIMA*, Hirokazu SAKAMOTO*, Mary SHIBUYA*, Shumei TERADA*, and Tatsuo SATO. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

Thursday, July 10, 1997

10:00 Video demonstration of the topographic anatomy of the male pelvic plexus. SATO, Tatsuo, Hirokazu SAKAMOTO*, Sadaaki HEIMA*, Yoko TSUBOI*, Mary SHIBUYA*, and Shumei TERADA*. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

10:15 am

Refreshment Break
Posters/Demonstrations/Commercial Exhibits
Diamond Head Ballroom

POSTER SESSION II: All posters listed below will be on display throughout Thursday, 7:30 am – 5:00 pm Adjournment. Authors should staff their posters during poster display periods

The use of computer graphics design software for the production of layered illustrations in the teaching of gross anatomy. GRANEY, Daniel O., Robert HOLMBERG* and Jordan REHM*, Department of Biological Structure and Health Sciences Center for Educational Resources, University of Washington, Seattle, Washington, USA.

The effectiveness of a clinically-orientated student teach-learn program on student performance in the gross anatomy course. NAH Seang-Hoo and Krishnan SUBRAMANIAM, Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia.

Ten years of experience conducting an anatomy enrichment program for high school and allied health students. NEMITZ, James W., Daniel CARTER*, Robert M. FISK*, William D. MARTIN, and James P. WELLS*. West Virginia School of Osteopathic Medicine (WVSOM), Division of Structural Biology, Lewisburg, West Virginia, USA.

A morphomechanical study of the elbow joint with special reference to the contact area between the radial head and the capitulum of the humerus. NIIRO*, Nobuhiko, Keiichi AKITA*, Gen MURAKAMI*, Seiichi ISHII*, and Tatsuo SATO. Department of Anatomy, Department of Orthopedic Surgery, Sapporo Medical University, Sapporo, Department of Anatomy, Tokyo Medical and Dental University, Tokyo, Japan.

Thursday, July 10, 1997

POSTER SESSION II: (CONTINUED)

A morphometric analysis of hippocampal neurodegeneration in thioacetamide induced fulminant hepatic encephalopathy (FHE) in male rats. NORTON*, Neil S., James R. McCONNELL* and Jorge F. RODRIGUEZ-SIERRA*. Department of Oral Biology, Creighton University School of Dentistry, and Departments of Radiology and Anatomy, University of Nebraska Medical Center, Omaha, Nebraska, (sponsored by M. E. Jergenson).

Lack of vasa vasorum and probable cerebrospinal fluid nutriment of outer layers of spinal intradural arteries. PARKE, Wesley W., Harry E. SETTLES, Paul C. BUNGER*, and Suliman SAID*, Department of Anatomy and Structural Biology, University of South Dakota School of Medicine, Vermillion, South Dakota, USA.

Anatomy through the power of today's desktop computer. PARRY*, Robert L., and Gary WIND, Departments of Surgery, The National Naval Medical Center, Bethesda, Maryland, Walter Reed Army Medical Center, Washington, DC, and The Uniformed Services University of the Health Sciences, Bethesda, Maryland.

Increasing awareness of women's health issues in early pre-clinical medical curriculum. PAWLINA, Wojciech, Kyle. E. RAREY, Lynn J. ROMRELL, William A. DUNN* JR., Richard RATHE*, and Nancy S. HARDT* Departments of Anatomy and Cell Biology, Community Health & Family Medicine, and Pathology and Laboratory Medicine, University of Florida College of Medicine, Gainesville, Florida, USA.

Extensor pollicis longus tendinitis. PHINNEY, Alexi J., Richard A. BERGER, and Stephen W. CARMICHAEL. Mayo Medical School Department of Anatomy, and Department of Orthopedics, Mayo Clinic and Mayo Foundation, Rochester, Minnesota, USA.

Vascularization of the scapular spine - preliminary study. PIETRASIK, Kamil M., Aleksandra KWOLCZAK*, and Bogdan CISZEK*. Department of Human Anatomy, Warsaw University Medical School, Warsaw, Poland.

Surgical anatomy of the posterior short gastric artery in gastric fundoplication. QUINN, T.H., T. MARTINEZ-SERNA*, C.J. FILIPI*, T. TOMONAGA*, Departments of Surgery and Biomedical Sciences, Creighton University School of Medicine, Omaha, Nebraska, USA.

Thursday, July 10, 1997

POSTER SESSION II: (Continued)

Quantitative changes in the collagen and elastic fibers of the fascia transversalis from patients with direct or indirect inguinal hernia. RODRIGUES, A.J Jr., C.J. RODRIGUES*, A.C.P. CUNHA*, and W.E. MITTELSTAEDT*, Lab.Anatomia Médico-Cirurgica e Serviço de Cirurgia Geral HC-FMUSP, São Paulo - SP., Brazil.

In vitro evaluation of fibroblastic response to different prosthetic meshes for abdominal repair. RODRIGUES A.J. Jr, C. J. RODRIGUES*, and I.L. TREVISAN* , Lab.Anatomia Medico-Cirurgica (LIM-02) HC-FMUSP, Sao Paulo - SP. Brazil

Evaluation of extracellular interstitial matrix components in prostate neoplasia. RODRIGUES, C.J. and A.J. RODRIGUES Jr. Hospital Universitario USP and Lab.Anatomia Medico-Cirurgica (LIM-02) HC-FMUSP, Av.Prof. Lineu Prestes, 2565. Cidade Universitaria. CEP 05508-900 - Sao Paulo -SP, Brazil.

Anatomy of the carpal tunnel in the female: carpal tunnel syndrome implications. ROHRS*, D. M., L. M. ROSS and K.E. STEPHENS*. Department of Anatomy, Michigan State University and East Lansing Orthopedics Assoc., East Lansing, Michigan, USA.

Anatomy of thoracic and abdominal incisions from the viewpoint of the course and branching patterns of the intercostal nerves. SAKAMOTO*, Hirokazu, Keiichi AKITA*, Sadao TAKAHASHI*and Tatsuo SATO. Department of Anatomy, - School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

Mode of masticatory muscle attachment and its relation to the mandible profile. SAKAMOTO, Yujiro and Yoshiro TAKANO. Second Department of Oral Anatomy, Tokyo Medical and Dental University School of Dentistry, Tokyo, Japan.

Modulation of specific stromal factors induces aberrant cornification in adult mucosal epithelium. SELVARATNAM*, Lakshmi, Harshad NAVSARIA*, Alan T. CRUCHLEY*, Irene M. LEIGH* and David M. WILLIAMS*. Dept. of Anatomy, University of Malaya, Kuala Lumpur, Malaysia and Departments of Oral Pathology and Experimental Dermatology, St. Bartholomew's and The Royal

Thursday, July 10, 1997

POSTER SESSION II: (Continued)

London School of Medicine and Dentistry, London, U.K. (sponsored by K. SUBRAMANIAM).

The anatomical basis of microvascular anastomosis in the neck. SHIMA*, Harunobu, Michael VON LÜDINGHAUSEN*, Kohsuke OHNO*, and Ken-ichi MICHI*. First Department of Oral and Maxillofacial Surgery; School of Dentistry, Showa University, Tokyo, Japan. *Department of Anatomy, University of Würzburg Würzbrug, Germany.

An anatomical study of the relationships between the lateral pterygoid and temporalis muscles with special reference to their innervation. SHIMOKAWA, Tatcashi*, Keiichi AKITA*, Kunimichi SOMA* and Tatsuo SATO. First Department of Orthodontics, Department of Anatomy, Tokyo Medical and Dental University, Tokyo, Japan.

Presence of peptidergic nerves in various male reproductive organs in the rat. SINGH*, Gurmit and Yee-Kong, NG*. Dept. of Anatomy, Faculty of Medicine, National University of Singapore, Kent Ridge, Singapore (sponsored by S. MARKS).

The neoclassical anatomy lab. STEPHENS, Robert E. and Karen HASS WENDEL, Department of Anatomy, University of Health Sciences College of Osteopathic Medicine, Kansas City, Missouri, USA.

The frontal sinus: A unique anatomical landmark for forensic identification SUBRAMANIAM, Krishnan, Phrabhakaran NAMBIAR* and Murali D.K. NAIDU. Departments of Anatomy and Oral Biology, University of Malaya, Kuala Lumpur, Malaysia.

The spatial arrangement of the branches of the pancreatic duct in the head of the pancreas. TAKAHASHI*, Sadao, Keiichi AKITA* and Tatsuo SATO. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

Light microscopy and image cytometry of large cell lymphoma. TAN*, Yi, Gurmit SINGH*, B-H BAY*, and C-M FONG*, Department of Anatomy, National University of Singapore and Department of Pathology, Singapore General Hospital (sponsored by S. MARKS).

Thursday, July 10, 1997

POSTER SESSION II: (Continued)

Quantification of the superior head of the lateral pterygoid muscle attachment to the temporomandibular joint complex. TUCK*, Nathaniel R., JR., Michael L. KIELY, Adam L. WILDING*, Gregory D. CRAMER, Joel WEISBERG*, Shari R. WEBSTER* and Shahar KENIN*. National College of Chiropractic, Department of Anatomy, Lombard, Illinois, USA

"Anatomic VisualizeR®": a Virtual Reality (VR)-based learning application. VU, Dzung and Helene HOFFMAN*, School of Anatomy, University of New South Wales, Sydney, Australia. School of Medicine, University of California, San Diego, USA.

The cytoskeleton, cell attachment and survival of osteoblasts in osteopetrotic(tl) rats. WATANABE,H.^{1,2}, C.A. MACKAY¹, E. H. RISLAUSKISI*, A.MASONSAVAS¹, T.YANAGISAWA^{2*} and S.C.MARKS, JR.¹ ¹Department of Cell Biology, University of Massachusetts Medical School, Worcester, Massachusetts, ²Department of Ultrastructural Science, Tokyo Dental College, Chiba, Japan,

The development of the propulsive hind limb in human and non-human primates: A comparative model. WELLS*¹, James P. and Jean E. TURNQUIST*². ¹West Virginia School of Osteopathic Medicine, Division of Structural Biology, Lewisburg, West Virginia and ²University of Puerto Rico, Department of Anatomy, San Juan, Puerto Rico. (sponsored by James W. Nemitz).

Platform Session IV: Medical Education

Moderator: Stewart Mennin

10:45 Teaching gross anatomy in a changing curriculum: where are we going? PETERBORG, Larry J. Department of Pathology and Anatomical Sciences, University of Missouri School of Medicine, Columbia, Missouri, USA.

11:00 Effective use of the Internet for curricular materials. MacPHERSON, Brian R., James G. TIEMAN* and Robert F. RUBECK*. Anatomy & Neurobiology and Academic Computing in Medical Education, University of Kentucky Medical Center, Lexington, Kentucky.

Thursday, July 10, 1997

Thursday, July 10, 1997

3:00 Educational Affairs Symposium

Moderator: Robert Leonard

4:00 Special Interest Group Meeting for Directors of Willed-Body Programs (All interested registrants invited to attend)

Moderators: Marita Nelson and Dan Graney

5:00 Adjourment

Evening Events

Hawaiian Regent Hotel - *Regent Ballroom*

6:30 pm Banquet Socializer (Cash Bar)

7:00 Annual Banquet and Entertainment

8:00 Presentation of Honored Member Award: to Tatsuo Sato, M.D. Ph.D. Professor of Anatomy and Head Second Department of Anatomy, Dean, Faculty of Medicine Tokyo Medical and Dental University.

9:30 Evening Adjourment

Friday, July 11, 1997

7:30-8:30 Educational Affairs Committee Meeting
(for members of Committee)

8:00-9:00 a.m. Registration and Continental Breakfast
Posters/Demonstrations/Commercial Exhibit
Diamond Head Ballroom

Platform Session V: Embryology and Pelvis/Perineum

Moderator: Daniel Graney

9:00 Redefining the study of developmental anatomy. GILROY, A.M. Departments of Surgery and Cell Biology, University of Massachusetts Medical School, Worcester, Massachusetts, USA.

9:15 Mammalian whole embryo culture: A powerful research tool for the study of teratogenesis. SUBRAMANIAM, Krishnan, James P. TRAVERS*, Murali D.K. NAIDU, Lakshmi SELVARATNAM*, John P. JUDSON* and A.M. HASSAN*. Department of Anatomy, University of Malaya, Kuala Lumpur, Malaysia.

9:30 Deep perineal "space" as defined by magnetic resonance imaging. MYERS*, Robert P., Bernard F. KING*, and Donald R. CAHILL, Departments of Urology, Radiology and Anatomy, Mayo Clinic, Rochester, Minnesota, USA.

9:45 An exploration of ethical issues in contemporary anatomy. JONES, D. Gareth Department of Anatomy and Structural Biology, University of Otago, Dunedin, New Zealand.

10:00 ***Refreshment Break***
Commercial Exhibits

Friday, July 11, 1997

Platform Session VI: Lower Limb and Back

Moderator: Brian R. MacPherson

- 10:45 The impact of the arterial blood supply of the femur for the transplantation of femoral diaphyses and the knee joint. BURGER², R, M. H. KIRSCHNER^{*1}, O. GABER^{*2}, G.O. HOFMANN^{*3}, J. MENK^{*4}, and K.U. HUBNER², ¹Chirurgische Klinik u. Poliklinik der Ludwig-Maximilians-Universität München Klinikum Grosshadern, Deutschland, ²Anatomisches Institut der Ludwig-Franzens-Universität zu Innsbruck, Österreich, ³Berufsgenossenschaftliche Unfallklinik Murnau, ⁴Anatomisches Institut der Universität Hamburg, Deutschland
- 11:00 Magnetic resonance angiography of fasciocutaneous perforators from the peroneal artery. GROSSMAN*, Richard, David SALONER*, Charles ANDERSON*, James ANTHONY*, David YOUNG* and Stephen MATHES. University of California San Francisco, Division of Plastic Surgery and Dept. of Radiology, San Francisco, California, USA.
- 11:15 The clinicoanatomical comparison of septocutaneous flap in the thigh region. SHIMIZU Toshiyuki, Dean R. FISHER, Stephen W. CARMICHAEL, Uldis BITE*, Kohsuke OHNO*, Ken-ichi MICHI*. Division of Plastic Surgery and the Department of Anatomy, Mayo Clinic/Foundation, Rochester, Minnesota, USA and First Department of Oral and Maxillofacial Surgery, Showa University, Dental Hospital, Tokyo.
- 11:30 Clinical microscopic anatomy of the human lumbar dura matter - a scanning electron microscopy study. DOBOSZ, Piotr M., Adam KOLESNIK Department of Pathology, The Children's Memorial Health Institute, Warsaw, Poland.
- 11:45 The Ice Man, Facts and Findings GABER,* Othmar, Sepp POISEL and Karl-Heinz KUNZEL* Institute for Anatomy, University of Innsbruck, Innsbruck, Austria.
- 12:15 **Adjournment of 14th Annual Meeting of the AACA**
- 12:30 **Meeting of New Executive Council**

Saturday, July 12, 1997



ANNOUNCEMENT

POSTGRADUATE COURSE

**Integrating
Clinical Anatomy
Throughout
Medical Education**

Saturday, July 12, 1997
University of Hawai'i at Mānoa
John A. Burns School of Medicine
Honolulu, Hawaii

Jointly Sponsored by:
The Creighton University School of Medicine
Department of Biomedical Sciences
Division of Continuing Medical Education
and the
American Association of Clinical Anatomists
in cooperation with the
John A. Burns School of Medicine
University of Hawai'i at Mānoa

The Creighton University School of Medicine designates this CME activity for a total of 6 credits in Category 1 of the Physicians Recognition Award of the American Medical Association

This activity has been planned and implemented in accordance with the Essentials and Standards of the Accreditation Council for Continuing Medical Education through sponsorship of Creighton University School of Medicine and the American Association of Clinical Anatomists in co-operation with the John A. Burns School of Medicine, University of Hawai'i at Mānoa. The Creighton University School of Medicine is accredited by the ACCME to provide continuing medical education for physicians.

Detailed Announcement enclosed with registration form. Separate registration fee

ABSTRACTS

ACLAND, Robert D. and Ivan LJUBIC*. Division of Plastic and Reconstructive Surgery, University of Louisville, Louisville, Kentucky, USA. Creating a motion picture image of the pelvic diaphragm.

Most students have difficulty in gaining a three-dimensional appreciation of the pelvic diaphragm. For the first-time learner, the most useful viewpoint is at eye level, with the body in the upright position. This is best attained with specimens sectioned in the median sagittal plane. It is helpful to maintain this viewpoint and to stay on the same side of the body, in building up an understanding of the pelvic walls and floor. It is profoundly helpful toward a three-dimensional understanding, to have the specimen (or its image) set up so that it rotates about a vertical axis. The student first needs to gain a clear three-dimensional understanding of the bones which surround the pelvic cavity and their orientation in the upright posture. He/she next needs to understand the sacro-tuberous and sacro-spinous ligaments and the key muscles of the pelvic wall, piriformis and obturator internus. Once the student clearly understands these structures, he/she can readily add the muscles of the pelvic diaphragm to the picture. In discussing a practical way to achieve these teaching and learning goals, this presentation will show some of the steps that have been involved in producing the section of the Video Atlas of Human Anatomy that describes the pelvic cavity.

AGUR, Anne, Nancy McKEE* and Roger LEEKAM*. Departments of Anatomy and Cell Biology, Surgery and Medical Imaging, Faculty of Medicine, University of Toronto, Toronto, Canada. Accessory soleus muscle.

Purpose: To investigate the frequency and presentation of the accessory soleus muscle. Previous work: In the anatomical and clinical literature the presence of an accessory soleus muscle has been considered a rare occurrence, but Romanus et al (1986) suggested the anomaly occurs more frequently than previously described, although the frequency has not been cited. Methods: Fifty pairs (25male/25female) of soleus muscles were dissected and examined in cadaveric specimens. Results: An accessory soleus muscle was found unilaterally in 3 specimens, 2 female and 1 male. (Frequency =6%). All cases presented as a distal belly medial to the tendo calcaneus. Two of the accessory muscles originated from the medial aspect of the anterior aponeurosis of soleus and inserted into the calcaneus, one via the tendo calcaneus and the other via a separate tendon. One specimen presented as a duplicate miniature soleus originating distally from the anterior aponeurosis of soleus as a separate muscle and inserting by a short tendon to the calcaneus anterior to the attachment of the tendo calcaneus. Plantaris was present in all 3 specimens. Conclusions: An accessory soleus was found unilaterally in 6% of cadavers. Presentation varied in all 3 cases. Significance: Clinically, accessory soleus muscles have been associated with pain and swelling on exercise (Ger et al, 1976) and equinus foot deformity (Bonnell et

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al, 1969). EMG, CT and MRI, have been useful in differentiating accessory muscles from soft tissue tumors. Embryologically this anomaly may result from splitting of the muscle early in development or in some cases it may have originated as two separate muscles.

AHARINEJAD, Seyedhossein, Peter FRANZ*, Wilhelm FIRBAS and Sandy C. MARKS Jr. Departments of Anatomy and ENT, University of Vienna, Austria and of Cell Biology, University of Massachusetts Medical Center, Worcester, Massachusetts, USA. The skeletal and microvascular pathology of the middle ear in osteopetrotic (tl) rats and its improvement after CSF-1 treatment.

Osteopetrosis, a metabolic bone disease due to reduced bone resorption, is characterized by skeletal sclerosis. One mutation in the rat, toothless (tl), has few osteoclasts and a poorly developed skeletal microvasculature, both of which are enhanced following treatment with colony-stimulating factor-1 (CSF-1; Bone, 13:89-93; 1992). Preliminary results indicate that tl rats have a conductive but not a sensorineural defect in hearing. We analyzed the stapes footplate and microvasculature of the temporal bone in tl rats, using light microscopy and transmission electron microscopy (TEM) of sections and scanning electron microscopy (SEM) of casts. The stapes in mutants consisted of porous, primitive chondroid bone, rich in calcified cartilage and matrix cells but few osteoclasts and osteoblasts and without ankylosis to the oval window. The stapes in normal rats consisted of denser bone with few cells. TEM showed thick, redundant cement lines and SEM of microvascular casts revealed blunted angiogenesis in mutants. Treatment with CSF-1 restored angiogenesis, with prominent capillary sprouting and increased bone remodeling eliminating excessive cartilage and bone. The increased porosity of tl bone was transformed qualitatively and quantitatively after CSF-1 treatment by activation of bone turnover. These results show that the primitive chondroid framework of the ossicles in tl rats may be related to their auditory deficiency and that this is improved after CSF-1 treatment.

Supported by the Grant No. DE-07444 from NIH.)

BAKKUM*, Barclay W. Department of Anatomy, The National College of Chiropractic, Lombard, Illinois (sponsored by G.D. CRAMER). Preliminary anatomic evidence of partitioning in the human brachialis muscle.

Many mammalian muscles appear to be partitioned into neuromuscular segments. Each segment of a muscle is a subvolume of fibers that is innervated by an individual muscle nerve branch and contains motor unit territories with a unique array of physiological characteristics. The human brachialis muscle has not been investigated for evidence of these segments. Both arms of ten (10) embalmed adult human cadavers were meticulously dissected to expose the brachialis muscle and its nerve supply (n=20). In all cases (100%) the brachialis muscle was easily

separated along a perimysial plane into two portions by blunt dissection. One of the portions was located superficially and somewhat laterally, while the other portion was deep and somewhat medial. In all but one case (95%), there was a single primary nerve branch from the musculocutaneous nerve that supplied each portion of the muscle. Usually the two primary nerve branches arose from the musculocutaneous nerve as a single branch, but this branch invariably split into two before entering the substance of the muscle. In all cases the branch to the deep portion of the muscle entered the muscle from a few millimeters to almost two centimeters distal to the entry point of the other branch.

BOELDERL, Andreas*, Herwig DANIAUX*, Anton KATHREIN* and Herbert MAURER*+. Department of Trauma Surgery, Institute of Anatomy, University of Innsbruck, Innsbruck, Austria (sponsored by S.POISEL). Endangering of the Ramus medialis rami dorsalis nervi spinalis by the dorsal approach to the thoracolumbar spine.

Postoperative atrophy of the Musculus erector spinae caused by denervation after surgical treatment by a dorsal approach and ensuing instability of the spine has been observed (Sihvonen, 1993). To emphasize the anatomical topography of the thoracolumbar spine 10 formol-fixated, latex-injected specimens have been prepared in detail by using an operating microscope; also 5 fresh cadavers have been cut in horizontal and vertical planes by rotation cryotomy (RCT) to confirm unchanged anatomical topographical conditions. In thoracolumbar spine ligamentary fixation of the medial branch of the dorsal root of spinal nerve is found lateral to the superior articular process. The nerve passes lateral the superior articular process and is fixed by strong fibers of the Ligamentum mamillo accesorium between the Processus mamillaris and Processus accesorius. When the dorsal approach to the thoracolumbar spine is enlarged lateral to the articular process by removing the spinal muscles, the nerve is endangered. This may cause postoperative pain and dynamic instability even beyond the corresponding segments. From the results of anatomical study it can be concluded, that the surgical approach to the thoracolumbar spine from posterior should not be enlarged lateral to the articular process, in order to protect the Ramus medialis of the dorsal nerve root.

BRENNER*, Erich and Thomas SCHOELLER*, Institute of Anatomy and Clinics for Plastic and Reconstructive Surgery, University of Innsbruck, Austria (sponsored by S. POISEL). The masseteric nerve. A possible donor for facial nerve anastomosis? (preliminary report)

In the medical treatment of facial nerve paralysis a large number of different techniques have been developed to restore the function of the facial nerve as there

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are the ipsilateral (e.g. partial hypoglossal-facial, spinal accessory-facial, partial glossopharyngeal-facial), crossfacial nerve grafting, temporal muscle flaps or even free muscle transfers. None of these techniques uses the masseteric nerve as a graft for reconstruction of the facial nerve. This preliminary report deals with the anatomical base, which could lead to a new technique. The masseteric nerve leaves the infratemporal fossa through the mandibular notch, accompanied by the masseteric artery. At this level the nerve consists in one case (4%) studied of only one branch, in 14 cases (56%) of two branches, in 9 cases (36%) and in one case (4%) of four branches. There are three main reasons for considering the masseteric nerve as a possible donor for at least the orbicular branch of the facial nerve: (1) The approach to the mandibular notch is quite simple. (2) Since the nerve consists of two or more branches in most cases (96%), severe dysfunction of the masseter muscle should not occur. (3) If there is complete denervation of the masseter muscle, its function can be taken over by the temporalis muscle.

BRIGGS, Christopher A. and Seba CHANDRARAJ, Department of Anatomy and Cell Biology, University of Melbourne, Parkville, Victoria, Australia,. Department of Anatomy and Physiology, RMIT, Bundoora, Victoria, Australia. Observations on cervical vertebral motion segments in aged cadavers.

Common symptomatic joints lie between the 5th and 6th cervical vertebrae and the 4th and 5th lumbar vertebrae. While the relationship between nerve root compression and associated symptoms is well documented, this study seeks to find a link between these same symptoms and structural changes in the cervical spine. 32 cervical spines were obtained from the anatomy laboratory and autopsy room. These were sectioned in the sagittal plane and subsequently prosected for examination of facet and uncovertebral joints. Selected samples of tissue were removed for routine histological examination. Degeneration and thinning of the intervertebral disc between the 5th and 6th vertebrae was common. Encroachment into the vertebral canal by osteophytes in front and prolapsed ligamentum flavum behind was observed in 25% of the material. Cervical spines with prolapsed ligamentum flavum also displayed degenerative changes to the facet joints. Macroscopically the nerve roots and ganglia appeared normal. In a small percentage of material the spinal cord was indented by the encroaching structures. It is suggested that symptoms of cervical spondylosis could be due to destabilisation of the vertebral motion segment and not necessarily the result of direct impingement of the cervical nerve root.

BRIGGS Christopher A, Norman EIZENBERG*, Craig ADAMS*, Priscilla BARKER*, Department of Anatomy and Cell Biology, University of Melbourne, Parkville, Victoria, Australia. 'Interactive anatomy': a novel approach to teaching anatomy.

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'Interactive anatomy', is a CD-ROM currently under development at the University of Melbourne which combines text with multimedia. It incorporates scanned images of real dissections and life models for normal surface anatomy orientation. The unique design of the program allows students to control the rate and sequence of revealing the architecture of the body. Regions (e.g. the scalp), layers (e.g. skin), systems (e.g. arterial), or individual structures (e.g. the superficial temporal artery) may be highlighted and labeled, or removed and replaced at will. A modular design enables the different subdivisions of the body to be easily defined and studied in any order. In association with the regional anatomy are interactive problems based on common clinical procedures. Since the internal organisation combines both regional and systemic perspectives and clinical problems, it is appropriate for both traditional and problem-based courses. It is also valuable in programs that have followed the trend to reduce or eliminate dissection time. The design of optional pathways in the accompanying text allows a student to orient themselves to view images, read text and confront problems either at a basic level, or at a level commensurate with their anatomical knowledge. There are many optional revision questions of clinical relevance. (Supported by CAUT National Teaching Development Grant).

BURGER², R. M. H. KIRSCHNER*¹, O. GABER*², G.O. HOFMANN*³, J. MENK⁴ and K.U. HUBNER², ¹Chirurgische Klinik u. Poliklinik der Ludwig-Maximilians-Universität München Klinikum Grosshadern, Deutschland, ²Anatomisches Institut der Ludwig-Franzens-Universität zu Innsbruck, Österreich, ³Berufsgenossenschaftliche Unfallklinik Murnau, ⁴Anatomisches Institut der Universität Hamburg, Deutschland. The impact of the arterial blood supply of the femur for the transplantation of Femoral Diaphyses and the Knee Joint

In 36 injected specimens of the thigh the nutritive role of the periosteal and intraosseous blood supply was examined for the transplantation of vascularized allogenic femoral diaphyses or knee joint in human beings. Results :The height of the femoral resection in knee joint transplantation is located at the level of 8-12 cm above the condyles. Diaphyseal transplants can be prepared from the minor trochanter down to the level 12cm above the condyles with a vascular pedicle from the deep femoral artery. For longer grafts one also has to consider the branches of the femoral artery, for shorter grafts the entry of the nutrient vessels.

CANOVAS*, François JP., Didier B. LEDOUX*, François L. BONNEL, Department of Anatomy, Faculté de Médecine de Montpellier, France. Biometry of the capsular ligaments of the wrist.

The aim of our study was to measure the length, the width and the inclination in the coronal plane of the capsular ligaments of the wrist and to express its as a

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ratio analyzing the correlations between these measurements and bone index that have been unreported in the literature in our knowledge. The capsular ligaments were studied from 15 cadaveric upper limbs and dissected by the same author with magnifying glass. We identified 11 volar and 2 dorsal intracapsular ligaments. For each ligament, we measured the length to its middle and to its proximal and distal edge, the width to its average portion and the inclination in the frontal plane. A statistical analysis was performed on the S.A.S. System and correlations were performed with the Kendall test. There was a difference between the proximal or distal length with the middle length for four ligaments. In this case, there was a significant correlation between the proximal or distal length and the middle length. The lengths of capitate, the length of the third metacarpal bone and the carpal height were significantly correlated with four ligaments. There were correlations between the length of one ligament and that of all others. There was no correlation between the inclination of radius and the inclination of ligaments in the coronal plane. Nevertheless, there were six significant correlations between the inclination of one ligament and that of all others. Salverberg in a biomechanical study reported the lengths of capsular ligaments that have been removed with the proximal and distal bone insertion. As indicated by the author, the lengths measured do not correspond exactly to the lengths measured in situ and in fact our measurements are always superior to those performed by Salverberg. Smith measured the lengths of five ligaments with IRM. The lengths measured with IRM are always very inferior to those measured in our study. The no or poor correlation between the lengths or the inclinations and the bone index, despite the sample was quite homogenous, can be explained by an insufficient number of cases, or by the methodology used in the study. The position of the wrist and the level of ligamentous insertions influenced certainly the results. Nevertheless, the significantly correlations between the lengths or the inclinations of one or two ligaments with that of all others indicate that the ligamentous measurements are in agreement for a same wrist. Even if our biometric results cannot be consider as definitive results, the collected data will be certainly useful for the study of wrist kinematic by image processing.

CASEY, Michael A. and James H. Sheetz. Department of Cell Biology, University of Alabama School of Medicine, University of Alabama at Birmingham, Birmingham, Alabama, USA. Case-based learning in gross anatomy: initial impressions.

In an effort to promote active learning of gross anatomy in a clinical context, case-based learning (CBL) was introduced into the first-year gross anatomy course (20 weeks duration; 180 contact hours) for medical students. The class of 170 students was divided into 8 groups of 21-22 students. Each group met twice weekly to discuss pre-assigned case studies in clinical anatomy. An anatomist, often paired

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with either a clinical faculty member, resident, or 4th year medical student, facilitated the small group discussion of the cases. Following a one-hour discussion, the students went to lab with the same anatomy faculty member for a dissection of the body region directly related to the day's clinical case. On Friday of each week, a review of the week's essential learning objectives was presented to the full class by an anatomy faculty member. The student response to the format was positive, with CBL listed as a "course strength" in the student evaluations. Seventy seven percent of the class rated CBL favorably, while 10% did not like the format. The remaining 13% had no strong feelings either way. Student performance on the internal written exams (USMLE-type), practical exams and the NBME Subject Exam in Anatomy was typical for UASOM students, indicating that the CBL format did not jeopardize the students' knowledge base in anatomy. Moreover, having prepared for and participated in a case discussion, students worked with an unprecedented degree of efficiency in the laboratory. The marriage of CBL and a traditional dissection experience offers medical students a relevant and challenging introduction to clinical anatomy.,

CASTILLO, Manuel H. and Mark RANZINGER*. Wright State University, School of Medicine, Department of Surgery, Dayton, Ohio, USA. Accuracy of cricothyroidotomy in ATLS training.

Cricothyrotomy is a well-known method of obtaining emergency airway access. Success of this procedure is dependent on careful technique and speed. We studied the anatomic location of the entry site on the neck of animals, which were utilized to teach the technique of cricothyrotomy. There were 47 dog necks examined with a total of 52 attempted cricothyroidotomies. Dissection revealed that 18 of the 52 attempts (34%) were malpositioned. This high failure rate demonstrated the lack of knowledge regarding neck anatomy by emergency room physicians, surgical residents and paramedics. The use of anatomic models, teaching clinical anatomy and repeated laboratory sessions may be required to increase the success rate of this life saving intervention.

COLLESELLI*, K., A. STENZL*, R. TOEREK*, S. POISEL, H. STRASSER*, and G. BARTSCH*. Institute of Anatomy and Department of Urology, University of Innsbruck, Innsbruck, Austria. Male rhabdosphincter - Morphology, blood supply and clinical relevance

In orthotopic bladder substitution we are more and more concerned about the anatomical basis to maintain functional integrity. In an anatomical study the male rhabdosphincter muscle and its blood supply was studied in 5 adult cadavers using magnifying lenses. In the male the rhabdosphincter is arranged as a circular collar around the urethra and the fibers of the rhabdosphincter muscle form an omega shaped loop around the anterior and lateral aspects of the

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membranous urethra. Using magnifying lenses we were able to demonstrate that the membranous urethra, respectively the rhabdosphincter muscle is supplied by fine branches of the superior vesical artery. We did not find any blood supply to the rhabdosphincter from the internal pudendal artery. Former studies on the nerve supply to the membranous urethra and the new study concerning its blood supply is of crucial importance for radical surgery in the true pelvis. Anterior exenteration was performed in specially fixed (alcohol-glycerine) cadaver specimens to study the surgical application of this type of anatomy. This type of anatomy is discussed with regard to continence (basal, stress) in orthotopic bladder substitution therapy in the male.

COLLINS, James D., Theodore Q. MILLER*. Department of Radiological Services, UCLA School of Medicine, Los Angeles, California, USA. Round shoulders and brachial plexus compression as displayed by MRI; 3D Reformat and MRA.

The alignment of the shoulder girdle varies in relationship to the thorax. The shoulder girdle normally descends in early years of life before a stable level is reached and this descent is somewhat greater in women than men. The scapula sags, moves anterior laterally with age, fatigue, poor health, debilitation and poor posture. Kyphosis of the thoracic spine and round shoulders develops. The coracoid processes rotate anterior-laterally consistent with the anterior-lateral rotation of the sagging scapula. The increase in tension on those structures which cross the first ribs, causes the lower trunk of the brachial plexus and the subclavian artery to move forward. This increases the pressure on these structures as they angulate around the posterior border of the anterior scalene muscle. The inferior trunk (C8-T1) is pulled forwards against the firm free posterior margin of the suprapleural fascia (Sibson's fascia) resulting in brachial plexopathy. Bilateral MRI demonstrates the acute angulation posterior to the anterior scalene muscles and compression of the low signal intensity surrounding the nerve trunks. Clinical histories, nerve conduction studies and chest radiographs were obtained from 22 patients prior to the MRI. The radiographs of the chest demonstrated lateral pillars of the cervical spine, low clavicles and "enlarged" shoulder girdle muscles. Bilateral MRI of the brachial plexus was conducted on the 1.5 Tesla G.E. Signa, 5.5 software, 44 cm field of view, 4 mm thickness with saline water bags along side the neck to enhance signal to noise ratio. T1 weighted and selective Fast Spin Echo (FSE) imaging sequences were acquired. Coronal, transverse, transverse oblique, sagittal, bilateral abduction external rotation of the upper extremities, 2D Time Of Flight Magnetic Angiography (MRA) were obtained. The authors found dorsal flexion of the cervical spine narrowed the angle between the tendon of the anterior scalene muscle and the rib. Which compressed the subclavian artery and displaced the

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nerve roots. The slope of the anterior ribs seemed steeper in the female because of the smaller thoracic inlet (Clin. Anat 8:1-16,1995). This presentation demonstrates nerve compression in "round shoulders" as displayed by MRI, 3D Reformat and MRA.

DAWSON, Brenda V. Department of Anatomy with Radiology, School of Medicine, University of Auckland, Auckland, New Zealand

The value of bequeathed patients in teaching and learning clinical anatomy

In a medical school with a sufficient number of patients bequeathed to the teaching program, students are able to explore the anatomy and pathology of these people and to see a broad spectrum of common diseases reflecting those of the elderly population in general. Regional clinical anatomy is studied in small groups with the help of radiology and surgery registrars. Towards the end of the course, the group presents the patient as they would a living patient including available medical history, physical inspection and variations from the norm and any morbidity. They are asked to reconstruct the events leading to death. This information is then compared with the death certificate and discussed. As a result students learn early to respect patients and treat them as individuals, not specimens. They obtain early exposure to clinical problem-based learning and the fundamental relevance of anatomy to medicine. In these times of decreasing autopsies and fewer ward patients, they are exposed to the terminal stage of common illnesses in some 20 patients. They learn to question death certificate information and to appreciate the importance of seeing the evidence and course of disease in individual patients.

DIMOPOULOS*, Chris and Marios LOUKAS* Department of Human Anatomy Warsaw Medical School and Department of Applied and Clinical Physiology Warsaw Medical School, Warsaw, Poland. (sponsored by D.O. Graney). An anatomical description of the mastoid canals.

In recent years most features of the skull are well described in standard textbooks of anatomy and surgery. However, mastoid canals lack satisfactory documentation, according to the literature and their clinical significance should receive more attention. The mastoid canal-tunnel is located anteroinferior to the asterion just in front of occipitomastoid suture. The vessels traversing the tunnel were found to be a branch of the occipital artery. In the present study 94 mastoid regions of 47 dry skulls were examined, 2 instances were observed. The following results were found statistically significant ($P < 0.05$) by "t" test. Of these, 58 (61.7%) mastoid regions possessing mastoid tunnels, 37 (64%) of them were unilateral and the 21 (36%) were bilateral. Of the unilateral tunnels, 25 (67.6%) were right and 12 (32.4) were left. The other 36 (38.3) mastoid regions did not possess a mastoid canal. The distance between the two openings of the mastoid

tunnels ranged from 2 to 21 mm. The clinical importance of this region during surgical procedures of the transtemporal route and in structures of the posterior cranial fossa should be taken under consideration. The above findings may help the surgeon in any operation in that region to avoid any vascular destruction.

DISCHER* William F., Elizabeth C. LOCKETT. Human Developmental Anatomy Center, National Museum of Health and Medicine, Armed Forces Institute of Pathology, Washington D.C., USA. (sponsored by Dr. Adrienne NOE). Carnegie embryo computer models and the emulation of embryonic development.

The Human Developmental Anatomy Center at the National Museum of Health and Medicine Armed I Forces Institute of Pathology utilizes morphing, software for the emulation of embryonic development. Serially-sectioned embryos at sequential stages of development are imaged and digitized. The digital data is then used to create the three-dimensional models of applicable anatomic structures. The renderings of these structures are then merged over time using morphing software. These reconstructions, while created from multiple individuals, provide a method of viewing anatomic development as though it were a single individual. This three-dimensional method allows investigational insight into the development process. The methods and results of this morphing approach are presented. In addition, an update of HDAC activities is presented, including the new look of the HDAC web site, the expanded on line data set, new additions such as the Cornell collection and results of the imaging of unsectioned Carnegie embryos.

DOBOSZ, Piotr M., Adam KOLESNIK Department of Pathology, The Children's Memorial Health Institute, Warsaw, Poland. Clinical microscopic anatomy of the human lumbar dura mater - a scanning electron microscopy study

Commonly accepted method of the regional anesthesia - the spinal anesthesia needs the puncture of the dura mater. Traditional descriptions suggest that human dura mater is composed of one or two layers of the fibrous bunches. We studied 20 cuttings of the lumbar dura mater (LDM) explanted from the cadavers (unfixed and fixed) available at our Departments. Using the procedure described by Ohtani et al. (1988) the lumbar dura mater after fixation in 10% buffered formaldehyde solution the maceration in 10% NaOH solution (20°C, 7 days) was performed. Thereafter specimens were fixed in 1.5% tannic acid solution (overnight) and then post-fixed in 1% OsO₄ solution. After dehydration in graded series of ethanol the specimens were air dried. Coating with Au was performed using the JEOL JFC-1100 coater and specimens were observed in scanning electron microscope JEOL JSM-35C (25-35kV). Following observations have been made: 1. surface of the LDM is composed of two layers: external and internal

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superficial laminae; 2. under these superficial laminae two deep layers were found: external and internal deep laminae. The configuration is symmetric on external and internal side of the LDM and the internal deep lamina is the central, single membrane. Several intralaminar fibers were observed between the deep layers on the LDM. The external laminae are composed of thin fibers organized in thin bundles (external superficial) or of the chaotic, thin fibers (internal superficial). In opposition, the deep layers are composed of thick multifibrillar, spliced bundles. Each bundle is wreathed with fine fibers. Obstruction of the punctured LDM observed by other authors might be caused not by contractile cell elements but by restoration of the configuration of the collagen fibers of the LDM. This fact may be important for understanding the mechanism of anesthetic agent penetration during the simultaneous spinal and epidural anesthesia.

DOERR, Ralph J., Carmine M. VOLPE*, Mahmoud N. KULAYLAT*, and Edward L. BRADLEY III*. State University of New York at Buffalo, Buffalo, New York, USA. Pancreatic mucinous ductal ectasia: Precursor of malignancy and relationship to chronic pancreatitis.

Mucinous ductal ectasia (MDE) of the pancreas is an uncommon disease characterized by massive dilatation of the pancreatic duct and its branches. The epithelium of these lesions bears close resemblance to classic mucinous cystic neoplasms. We have treated 5 patients with MDE. All 5 patients presented with abdominal pain and endoscopic retrograde cholangiopancreatography (ERCP) evidence of marked pancreatic ductal dilatation, filling defects and extensive mucus formation. All 5 patients had a clinical course consistent with recurrent or chronic pancreatitis. Therapy included endoscopic pancreatic duct stenting in 2 (failed) and ultimately surgery in all 5. MDE was confirmed pathologically in all patients with mucinous type epithelium (5), hyperplasia (3) and intraductal papillomatosis (1). Histologic confirmation of chronic pancreatitis was found in 3 patients and invasive adenocarcinoma in 2 patients. MDE has characteristic endoscopic and imaging findings. MDE is seen with chronic pancreatitis and, similar to other mucinous cystic lesions of the pancreas, is strongly associated with invasive carcinoma. MDE does not respond to endoscopic stenting and should be managed by definitive resection.

ENDO*, Hiroshi, Katsunori SASAKI*, Akira TONOSAKI* and Takamasa KAYAMA¹*. Departments of Anatomy and Neurosurgery¹, Yamagata University School of Medicine, Yamagata, Japan. ICAM-1 distribution on choroid plexus, arachnoid membrane and dural sinus of rats: Analysis with immuno SEM and TEM.

The immunity in the brain is specific and the cerebrospinal fluid (CSF) system seems to function differently from the general vascular system. But it remains

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unknown how immune-associated adhesion molecules function in both systems. Now, we disclose difference of ICAM-1 (intercellular adhesion molecule-1) distribution in choroid plexus, arachnoid and dural sinus with immuno SEM and TEM. The lateral ventricles of rats were injected with lipopolysaccharide (LPS). After removal of the tissue samples, they were incubated with primary anti-rat ICAM-1 antibody and secondary anti-mouse IgG antibody (15nm gold particles). SEM and TEM samples were prepared with the conventional method. SEM samples were observed with backscatter electron imaging. As control, saline was injected instead of LPS. The microvilli on the choroid plexus expressed much of ICAM-1 (30 gold particles/ μm^2). The arachnoid epithelial layers expressed moderate ICAM-1 (12/ μm^2). ICAM-1 was minimally reactive on the dural sinus (2/ μm^2) and the value was near to that of the control. Our experiments showed the immunological up-regulated responses in the CSF system, but had a little effect in the blood system.

GABER,* Othmar, Sepp POISEL and Karl-Heinz KUNZEL* Institute for Anatomy, University of Innsbruck, Austria. The Ice Man, Facts and Findings
Ever since the sensational discovery of the glacial mummy in Sept. 1991 the body of the Ice man had been stored within an especially constructed cooling and conservation system. 64 scientific teams in fields of archaeology and natural sciences, had been busy to compile facts in order to identify the cadaver and to clearing up its circumstances of living. Based upon CT-Numerical data skull of the Ice Man had been reconstructed three-dimensionally. Tattoos were identified by special methods and afterwards interpreted. The basis for drawing specimens from intracorporeal regions is provided by CT-data sets and special devices for minimal invasive endoscopic technique were developed.** Histopathologic investigations, DNA-determination and proving of endo-parasites (including their genetic code) were fields of our interests. Paleobotanists could identify remains of pollen, herbage, grains, etc. in the guts of the Ice Man. Bacteriologists detected parasites, such as whipworms and others. Quartz sand found in the colon is responsible for the abrasions of the Ice Man's teeth, obviously.

**Also in virtual reality technique

GHABRIEL*¹, Mounir N., Meng Xiang LU*¹, Chris LEIGH*¹ and Gerry ALLT*². Department of Anatomy, University of Adelaide, South Australia, Australia¹ and Institute of Neurological Studies, University College London, UK² (sponsored by P. H. Abrahams). Dural vessel endothelial cell anionic sites and neurogenic inflammation: a preliminary assessment.

Endothelial cell (EC) anionic sites are thought to play a role in vascular permeability. Dural blood vessels are innervated by trigeminal nerve fibres and show increased permeability in nerve stimulation (neurogenic inflammation, NI).

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It was of interest therefore to assess the density of dural EC anionic sites in NI. NI was induced in 4 Sprague-Dawley rats by i.v. injection of substance P (SP, 5 μ g or 10 μ g/kg b wt) for 10 min. Two control animals were injected with saline. Cranial dura was removed after perfusion fixation with EM fixative under anaesthesia, cut into 500 μ m strips and labeled with cationic colloidal gold (CCG) either before embedding in epoxy resin or as ultrathin sections after embedding in LRW. The number of CCG particles (P) labeling luminal EC membrane in resin sections or abluminal membrane including the basal lamina (BL) in LRW sections was quantified in experimental and control animals. Preliminary results show that for luminal EC membranes the mean CCGP / μ m was not significantly different in experimental (20.9) from the control (18.4). For abluminal membranes/BL a higher mean in the experimental (21.1) was found than in the control (16.1) but the P value was = 0.1. A higher abluminal/BL density may be explained by perivascular extravasation of negatively charged plasma proteins in experimental animals. The similar density of luminal membrane labeling in experimental and controls reported here suggests that factors other than changes in the density of anionic sites may be responsible for the susceptibility of dural vessels to neurogenic inflammation.

GILROY, A.M. Departments of Surgery and Cell Biology, University of Massachusetts Medical School, Worcester, Massachusetts. Redefining the study of developmental anatomy.

The traditional medical school course in developmental anatomy was considered part of the first year basic science curriculum. However in recent years, in spite of its increased clinical relevance with advances in prenatal medicine, it frequently has been condensed, eliminated or absorbed into the Human Gross Anatomy course. Often the greatest concentration is on the embryonic and early fetal periods with only casual consideration given to the late fetal period and rarely, if any, to the postnatal period. The development of individual systems is emphasized over concurrent or interactive system development. To address these issues, an innovative Developmental Anatomy program is currently offered to a small number of senior medical students at the University of Massachusetts Medical School as a concentrated month long elective. The course spans the period between fertilization and adolescence with equal attention devoted to embryonic, fetal and postnatal development. The concurrent development of systems and the consequences of abnormal development during critical periods of growth is emphasized. Clinical correlations are provided by a minimum of 25 faculty in 20 different clinical specialties. This course provides an essential foundation for students applying to residency programs in pediatrics, family practice or obstetrics.

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GOODMURPHY, Craig G., Elizabeth J. AKESSON, Jill OSBORN, Vlad STANESCU, Sandra JOHNSON*, William D. REGAN*. Department of Anatomy, University of British Columbia, School of Medicine, Vancouver, British Columbia, Canada. Rotator cuff tears: their incidence in human embalmed, unembalmed and surgical specimens and an immunocytochemical comparison of torn and normal cuffs

The pathogenesis of rotator cuff injuries is not well understood. The present study investigated their incidence in cadaveric specimens. The hypothesis that tissue surrounding rotator cuff tears undergoes changes in fibroblast population and vascular distribution was also examined. A survey of 55 embalmed and 21 unembalmed cadaver shoulders was done. The incidence and morphometric characteristics of rotator cuff tears were recorded. In embalmed cadavers 26 rotator cuff tears were found with 9 on the right, 5 on the left and 6 bilaterally. In unembalmed specimens, of the 9 rotator cuff tears found, 4 were on the right, 1 was on the left and 2 were bilateral. Of the 76 cadaver shoulders surveyed, the incidence of tears was 46 percent. In addition to the cadaveric survey, morphological data from 6 unembalmed cadaver rotator cuff biopsies and 11 surgical rotator cuff tendon biopsies were collected, flash frozen in liquid nitrogen and studied using conventional histological and immunocytochemical techniques. Triple fluorescent labeling of tissue cryosections was performed. Hoechst nuclear stain was used to distinguish cellular from non-cellular components. Tissues were also labeled with anti-human Von Willebrand factor tagged with FITC (fluorescein isothiocyanate) for visualization of endothelial populations and anti-procollagen type I tagged with the fluorophore Cy3 for visualization of active fibroblast populations. Cell population demographics were calculated using a capillary index measuring capillary area per unit of tendon area and fibroblast index measuring number of active fibroblasts per unit tendon area. Tissue analysis is ongoing and these data, in conjunction with cell population distribution patterns, may provide insight into their cellular pathogenesis and be of importance in determining the surgical management of rotator cuff repairs.

GRANEY, Daniel O., Robert HOLMBERG* and Jordan REHM*, Department of Biological Structure and Health Sciences Center for Educational Resources, University of Washington, Seattle, Washington, USA. The use of computer graphics design software for the production of layered illustrations in the teaching of gross anatomy.

The availability of desktop computing has caused a renaissance in educational methods throughout the entire range of the educational process. Electronic syllabi, interactive computer programs, and use of the Internet have become standards not only in Universities but in primary schools as well. While many teachers can readily adapt text materials to this new age, the use of traditional

illustrative materials has come into conflict with copyright laws. Hence there is a need in many teaching settings to develop, graphic images independently that can be used for teaching purposes. Graphics design software, such as Adobe® Photoshop® was used to develop layered anatomical illustrations based primarily on regional anatomy. By developing a layered digital anatomical atlas the viewing of finished illustrations is no longer an end use. Viewers (faculty or student) can now become their own image editors once a master document image is constructed. Such an image consists of multiple layers of bones, muscles, nerves, blood vessels, etc. Users can inactivate or make a superficial layer translucent, and add, alter or delete objects as desired. From a master document individual images can be customized and made into file types appropriate for print, poster, slide or web site use. When these images are used in conjunction with desktop publishing software, such as Adobe® Pagemaker®, labeling can be applied for use in syllabi or raw leaders can be applied when the image is used in testing. The construction of a digital syllabus containing graphic material is extremely useful, even when it is used in a print medium. Because traditional copy processes produce second generation images there is always a degradation of all images that are not simple line copy. On the other hand, digital syllabi, complete with graphics, can be saved in a printer language (e.g. PostScript) and sent directly via a network to a modern copy machine, bypassing the scanning process, producing a quality first generation document.

GROSSMAN*, Richard, David SALONER*, Charles ANDERSON*, James ANTHONY*, David YOUNG* and Stephen MATHES. University of California, San Francisco, Division of Plastic Surgery and Department of Radiology, San Francisco, California, USA. Magnetic resonance angiography of fasciocutaneous perforators from the peroneal artery.

Reconstructive surgeons have made increasing use, in the 15 years since their description, of the fasciocutaneous system of flaps which receive their blood supply from arterial trunks whose branches travel in intermuscular fascial septa before fanning out to the skin. Recent refinements of magnetic resonance angiography (MRA) permit imaging of vessels as small as the fasciocutaneous perforators (FCPs) (2mm diam.), but to our knowledge no report has appeared of this application of the new technology. Challenges in the preparation of the fibula free flap, based on FCPs from the peroneal artery (PA), include preoperative knowledge of: 1) tibioperoneal anatomy, which usually requires conventional angiography with iodinated intravenous contrast; 2) the cutaneous distribution of the Cps, which requires Doppler ultrasound; and 3) the positions of the perforator branches on the PA and their course in the posterolateral intermuscular septum (p.l.i.s.), which have been studied mostly in cadavers due to technical limitations *in vivo*. Questioning whether MRA could address these issues, we performed a pilot

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study on the leg of a healthy volunteer. Tibioperoneal MRA provided detail sufficient to exclude absent PA, peroneal arteria magna and significant peripheral vascular disease, which might compromise the flap or the extremity. Four perforators were identified, 5, 10, 14 and 18 cm from the origin of the PA, of which all but the most proximal one were clearly fasciocutaneous and could in transverse reconstructions be traced within the p.l.i.s. from the PA to a point lateral to the midpoint of the posterior fibular shaft. One perforator could be traced as far as 3.5 cm further laterally, while the p.l.i.s. could be followed out to the skin. MRA provided anatomic information heretofore available principally through study of cadavers and clinical information that conventionally has been impossible to determine before surgery or has required multiple tests, some of an invasive nature. To our knowledge, this is the first report of the study of FCPs using MRA.

HAYAKAWA, Daisuke, Huayue Chen*, Shoichi Emura*, Akira Tamada*, Tomo YAMAHIRA*, Kishiko TERASAWA*, Marjan JAMALI*, Hideo ISONO and Shizuko SHOUMURA. Department of Anatomy, Gifu University School of Medicine, College of Medical Sciences Gifu University and Heisei College of Medical Technology, Gifu, Japan. Anatomical and statistical study on the branches of the celiac trunk in Japanese.

We studied the branching pattern of the celiac trunk in 719 Japanese cadavers. The findings were as follows. (1) Six hundred and forty-seven (90.0%) of the 719 cases belonged to Type I of Adachi's classification. They had a gastrohepatosplenic trunk and superior mesenteric artery arising from the abdominal aorta independently. Four hundred and seventy-seven out of 647 belonged to Group 1 that was considered to be a "normal" type. (2) Twenty seven (3.8%) belonged to Type II that had a hepatosplenic trunk and the left gastric artery, six (0.8%) to Type III that had a hepatosplenomesenteric trunk and the left gastric artery, six (0.8%) to Type IV that had a gastrohepatosplenomesenteric trunk, thirteen (1.8%) to Type V that had a gastrosplenic trunk and a hepatomesenteric trunk and eleven (1.5%) to type VI that had a gastrosplenic trunk and no hepatic artery ascending anterior to the portal vein. (3) Of the 719 cases, nine (1.3%) did not belong to any Group of Adachi's classification. We also compared this result with other reports and employed other classifications.

HIGUCHI*, Katsura and Kunio KOHNO*. Department of Anatomy, University of Tsukuba, Institute of Basic Medical Sciences, Tsukuba, Ibaraki, JAPAN (sponsored by T. SATO). The Extensor digitorum brevis manus enters into the Aponeurosis dorsalis digitorum manus of the third digit.

The Extensor digitorum originates from the Humerus and ends in the middle and distal phalanx from the second digit to fifth one forming the aponeurosis dorsalis digitorum manus. In the lower vertebrates, the Extensor digitorum profundus

appears, which originates from the forearm and enters into each Aponeurosis of the Extensor digitorum. Instead of the Extensor digitorum profundus, the Extensor indicis is seen only in the second digit of the human hands. As a rare anomaly (2.7%), the Extensor digitorum brevis manus originates from the carpal bones and inserts in the Aponeurosis dorsalis of the second digit. In that case, the Extensor indicis often lacks. We found the Extensor digitorum brevis manus in the both hands of a female of 88 years old. It has the following characteristics: 1) Both of them entered not into the second digit, but of the third one. 2) The Extensor indicis remained in both hands. 3) Two bifurcated tendons of the Extensor indicis ended in the second and third digits of the right hand. This case makes difficult simply to explain the genesis of the Extensor digitorum brevis manus. The Extensor digitorum brevis manus occasionally gives rise to a small swelling in the dorsal surface of the hand and physicians often mistake it for ganglions or tumors.

HIRAI*, Denitsu, R. Lisa HIRAI*. Creighton University School of Medicine, Omaha, Nebraska and University of Nebraska School of Medicine, Omaha, Nebraska. (sponsored by Tom Quinn) The triangle of Calot is not the same as it used to be. What happened?

The triangle of Calot, formed by the cystic duct, the hepatic duct and the cystic artery, was described by Jean Francois Calot in 1890. As time went by, the triangle was variously misinterpreted. Both anatomy textbooks and medical dictionaries defined the triangle being made up of cystic duct, common hepatic duct and liver. After this error was pointed out by an astute surgeon during 60's, correction of the definition was noted in all medical dictionaries and most of anatomy textbooks and atlases. With the introduction of laparoscopic cholecystectomy in the 90's, there has been sudden increase of literature citing the term "triangle of Calot". The search of MEDLINE on the use of this term yielded 51 articles that included the term "Calot" in the title or in the abstract. Of those, 50 articles were discussing biliary anatomy. Sadly, only 5 articles correctly defined the "triangle of Calot" exactly as Dr. Calot defined. There were flurries of monographs written on laparoscopic procedures, most of which contained inaccurate description of the triangle. Most recently, *coup de grâce* has been delivered. Authoritative surgical textbooks published recently—Mastery of Surgery, third edition by Nyhus et al (1997), Principles of Surgery, sixth edition by Schwartz (1994) and Textbook of Surgery, fifteenth edition by Sabiston (1997)--all defined the "triangle of Calot" incorrectly. If we are to use the name of the originator, we must adhere to the original description and not alter the definition.

HIRATA, Kazuaki, Department of Anatomy, St. Marianna University School of

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Medicine, Kawasaki, Japan. Relationship between the sympathetic trunk and the inferior thyroid artery.

The present study clarified the anatomical relationship between the cervical sympathetic trunk to inferior thyroid artery, based on the dissection of 477 sides of the necks of 191 male and 88 female Japanese cadavers. On the right side, the sympathetic trunk passed anterior to the artery in 73.9%, posterior to it in 22.7% and the trunk split to enclose the artery in 3.4%. On the left side, the trunk was found coursing anterior to the artery in 56.3%, posterior to it in 34.8% and the trunk split to encircle the artery in 8.9%. There was a significant difference in the percentage distribution of the three types between the right and left sides, while no significant difference existed between males and females. The collaterally symmetric cases of the trunk-artery relationship were found more frequently in males(60.4%) than in females(46.9%). The findings would be relevant to a higher variability of the inferior thyroid artery in females.

JERGENSON, Margaret A. and John M. BARTON*. Department of Oral Biology, Creighton University School of Dentistry, Omaha, Nebraska, USA. Asymmetry in the mandibular condyles of individual subjects.

This study was undertaken to examine the mandibular condyles of cadaver specimens for size and shape comparisons between large groups and to look at variations in the condyles of individuals. Temporomandibular joints of 106 cadavers (209 sides usable) were dissected and the condyle-disc complex was removed as a unit. The discs were then separated from the condyles and the condyles examined and measured for their height, depth and width. Photographs were also taken of each condyle and disc as a unit and separately. The resulting measurements were evaluated and there was found to be no significant difference in the average size of the condyles in large groups, regardless of gender, age or the presence of a natural dentition. However, statistical averages belie the findings in individuals. Though the condyles in any one individual are usually similar, there can be extreme variation in shape, size and surface contour between the right and left sides. The causes of the asymmetry could not be determined in this study. Examination of the surface contours and dimensions of one condyle in an individual do not allow one to draw any inferences in regard to the opposite condyle.

JONES, D. Gareth Department of Anatomy and Structural Biology, University of Otago, Dunedin, New Zealand. An exploration of ethical issues in contemporary anatomy.

Anatomy has traditionally been considered to be far removed from the realm of ethics. This is misleading. Ethical issues are pervasive in anatomy, although this has only recently been recognized. The use of dead bodies, as well as material

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from cadavers or human tissue removed during surgery, has been accepted for many years without much thought being given to the ethical dimensions of these activities. Similarly, the use of laboratory animals is associated with ethical problems, but these have not been seen as issues of relevance to anatomists. The study of archeological human remains has also not prompted much ethical debate within the anatomical community. All this has begun to change as the revolutionary renaissance we now know as bioethics broadens and transforms what had been the much more confined domain of medical ethics. Ethical analysis previously restricted to specifically clinical realms and to isolated topics such as abortion, is now being applied to the reproductive technologies and to organ transplantation, raising profound ethical queries at both ends of life. Other questions concern the definition of brain death, the status of the embryo, the relevance of the concept of the pre-embryo and of brain life. Additional issues are raised by aging and dementia. Questions such as these can only be addressed by reference to the human body, which is being increasingly exposed to ethical assessment. Given the centrality of the body to the work of anatomists, a recognition of the interrelationship between our own discipline and that of bioethics is becoming vitally important.

JONES, D. Gareth and Russell J. BARNETT* Department of Anatomy and Structural Biology, University of Otago, Dunedin, New Zealand. The contribution of plastination techniques to neuroanatomy teaching.

Over recent years this Department has experienced considerable problems in obtaining fresh brain material for teaching. As a result, considerable efforts have been made to utilize to its fullest extent the small amount of material available. A great deal of work has been focussed on developing and extending techniques for the plastination of brains. The major types of specimens plastinated have included whole brains, half brains, horizontal and coronal slices and prosections. In this manner it has proved possible to demonstrate a wide range of relevant features including the meninges, sulci and gyri, ventricular system, cranial nerves, major fibre systems, deep nuclei, the hippocampal formation and internal capsule. Conventional plastination techniques, such as the S10 procedure, make available well preserved dry, odorless and nontoxic tissue for handling and study and this is exemplary when external features are being studied. However, in order to highlight internal features (such as the distinction between grey and white matter), the P35 method with its use of a polyester resin P35, has proved invaluable. More recently, further advance has taken place due to the development of the P40 method, using the Biodur polymer P40, which has two distinct advantages compared to the P35 technique: it has a shorter production time and is less expensive. Together, the P35 and P40 procedures offer comparable results and have proved of enormous value for the study of slices of

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varying thickness. Both techniques are excellent at demonstrating very fine anatomical detail, thereby making them an indispensable addition to the range of plastination techniques currently available in neuroanatomy.

JUDSON, John P.,* Department of Anatomy, University of Malaya, Kuala Lumpur, Malaysia. (sponsored by K. Subramaniam). Impedance analysis as an effective tool in the study of body fat and composition.

Childhood obesity, in recent years, has been an area of immense interest to researchers and health personnel alike, in view of its alarming increase worldwide and its projected repercussions in adulthood. Newer methods like absorptiometry, ultra-sonography and bioelectrical impedance analysis are now available to assess body composition with relative ease and speed, in contrast to skinfold equations of yore. The present study was done on 180 primary school children to sample and assess the prevalence and magnitude of obesity in school children. The Bioelectrical Impedance Analysis (BIA) technique was used to estimate body fat and composition. The percentage body fat (PBF) was also independently arrived at using skinfold measurements and equations and compared with those obtained by the BIA technique. Analysis of the results showed much general agreement, especially for older children. A certain degree of contrariety was observed for younger children and in children who are extremely thin or obese for their age. It is concluded that in contrast to skinfold equations, the bioelectrical impedance analysis method is a simple, non-invasive and accurate procedure, giving rapid results about several indices of body composition, making it a superior and an effective tool in the assessment of body composition.

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KASUYA, Richard T., Marita NELSON and John MELISH. University of Hawaii John A. Burns School of Medicine, University of Hawai'i at Mānoa, Honolulu, Hawaii, USA. An integrated course in introductory clinical skills and clinical anatomy for first-year medical students.

Purpose: Integration of basic and clinical sciences is a goal and outcome of our problem-based learning (PBL) curriculum. In seeking to improve this integration, we have recently introduced a combined course covering introductory clinical skills and clinical anatomy to our first-year curriculum. The primary goal of the course is that students gain an integrated understanding of clinical anatomy in the context of the basic physical examination sequence and diagnostic imaging.

Other goals include learning the components of the problem-oriented medical record, medical interviewing and effective physician-patient communication.

Methods: The course meets for the first fourteen weeks of the first-year, involving 6-8 hours of structured activity per week. This class time is divided between larger

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group interactive demonstrations, dissections in the anatomy laboratory and supervised practice of clinical skills. Six afternoons are reserved for direct patient interactions under the supervision of faculty and volunteer physicians throughout our community. Students interview and examine selected patients, discuss and review pertinent clinical data and receive feedback on their interview, physical examination and communication skills. Additionally, supplemental self-directed resources including videotapes, computer-based learning, self-study lab modules and recommended readings are also incorporated into the curriculum. The organization and sequencing of the course follow the sequence of the basic physical examination, as do the PBL tutorial health care problems that are studied concurrently and serve as the foundation of our medical school's curriculum. For example, when students are focusing on the basic clinical skills, clinical anatomy and diagnostic imaging of the heart and vascular system, they are concurrently working through a health care problem on acute myocardial infarction in their tutorials sessions. The following week, focus shifts to the clinical skills, clinical anatomy and imaging of the abdomen and the related tutorial case covers acute viral hepatitis. Results: Students are required to pass an integrated laboratory examination, attend and satisfactorily complete all assigned activities and complete entry and exit questionnaires that assess their appreciation of the value of and interrelationships between, the various components of the course. At the conclusion of this course, students felt their understanding of clinical anatomy, clinical skills, elements of a strong physician-patient relationship, diagnostic imaging and human sexuality improved ($p < 0.05$). Their perceived value of the importance of each of these components was high both before and after the experience. Written feedback from clinical preceptors indicate that students are able to apply the materials from this course to their patient care experiences and feedback from tutors in subsequent units indicate that students are better prepared in anatomy and imaging aspects of health care problems. Discussion: We believe that this course represents an effective way of integrating and melding the learning of clinical skills, clinical anatomy and imaging. In doing so, we have been able to combine significant early patient care experience with a wide variety of other instructional strategies. We feel that our course demonstrates another vehicle for educational collaboration between basic science and clinical teachers in the context of a problem-based learning curriculum.

KATHREIN, Anton*, Andreas BOELDERL*, Thomas KLESTIL*, Herwig DANIAUX* and Walter RABL*¹. Department of Trauma Surgery, ¹Institute of Forensic Medicine, University of Innsbruck, Innsbruck, Austria. (sponsored by S.POISEL). Surgical anatomy of the upper cervical spine in regard to C1/C2 transarticular screw fixation in trauma- or orthopedic cases.

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Transarticular fixation of C1/C2 according to Magerl has been accepted broadly in fusions of the upper cervical spine within trauma- and orthopedic surgery. The anatomic situation within this region is complex and vulnerable. In order to examine the topographic anatomy an anatomical resp. experimental-surgical study has been performed to show the optimal site of screw positioning. In a first step 30 atlas-axis bone specimens were examined and measured in regard to the initially described fusion technique. In a second step 10 fresh, unfixed frozen specimens were led to serial cryosectioning in sagittal and coronal planes. Further 6 specimens were led to cryosectioning after transarticular screw fixation in typical way by use of an image intensifier. The ideal and most secure drill canal for placement of the screws lies immediately cranial to the articular joint space C2/C3, rising strictly sagittally through the so-called isthmus, crosses the C1/C2 joint within its dorsal third and perforates the anterior atlas wall in lateral projection on the superior margin of its anterior arch. A too far cranial direction can lead to irritation of the C0/C1 joint, medial perforation can endanger the dural sack and the medulla; a too flat direction can cause fatal damage to the vertebral artery. Correct screw positioning is difficult, especially in cases where deformities hinder the approach to the cervical spine or where a subluxation of the segmental joints alter normal anatomy.

KOLESNIK, Adam, Piotr M. DOBOSZ, and Dominik DOLINSKI*. Department of Pathology, The Children's Memorial Health Institute, Warsaw, Poland and Department of Anesthesiology, Warsaw Medical School, Warsaw, Poland. Ultrasound imaging of the infraclavicular fossa and its application for regional anesthesia

The adequate anesthesia in the hand surgery plays an important role for the conducting of the procedure. Nowadays, the brachial plexus block seems to be the method of choice. Although the infraclavicular approach to the brachial plexus was described many years ago and the majority of the handbooks contains the description of the techniques of infraclavicular brachial plexus anesthesia, the anesthesiologists choose rather the axillary and interscalene approach, which are supposed to be safer. The study we undertaken aimed to describe the topography of the infraclavicular part of the subclavian artery, subclavian vein and the brachial plexus, their relations to the skin and the pleura using the noninvasive methods of visualization - ultrasonography, which may be used on patients before the procedure. We examined 40 infraclavicular regions in 20 patients (10 males and 10 females) using the 5 MHz linear transducer. The position of the transducer was estimated according to the topographical landmarks for the infraclavicular approach described by Kilka (1995), which are, in our opinion, the best determined. Of course, it is impossible to visualize the brachial plexus itself, but the subclavian artery and the subclavian vein are very easy to see. According

to the anatomical data, the position of the plexus may be foreseen to be placed laterally to the artery. Five parameters were measured: distance between the surface of the skin and the pleura, between the skin and the subclavian artery, diameter of the subclavian artery, distance from the artery to the pleura and distance from the skin to the pleura 5 mm laterally to the subclavian artery. One has to remember, that the infraclavicular approach is, from the anatomical point of view, the modification of the axillary approach. Our results confirm this suggestion. The border of the pleura runs medially to the point of puncture and on this level there is about 40 mm distance between the skin and the brachial plexus. This fact makes, in our opinion, the infraclavicular approach safe to perform. Additionally, the close relations between the branches of the plexus in this region are the reason of the satisfactory sensory and motor block.

Gohar P. KYALYAN*. Department of Normal Anatomy; Yerevan State Medical University, Yerevan, Republic of Armenia (sponsored by D. O. GRANNEY). Histotopographic peculiarities of the changes of the gallbladder's mucous membrane microcirculatory unit in cholecystitis.

On histologic paraffin sections (20 mkm) which are stained with Gomory's sulfide method and silver impregnated in own modification "the morphometric peculiarities of gallbladder's mucous membrane microcirculatory unit (MU) are studied as well as in calculous and acalculous cholecystitis in 32 adults. It is shown that the definitive construction of MU is formed by means of communicated between each other deep (lies in the base of mucosa and is connected with the basic vascular construction) and superficial (subepithelial) of capillary nets. The latter differs not only by big diameter and the thickness of microvessel's arrangement, but also contains "thoroughfare" capillaries which carry out the role of arteriovenous shunts. The majority of lymphatic capillaries are also situated subepithelially in the gleam of mucosa's pleats. In fact the structure of MU creates the possibilities for active absorption of water, providing with the concentrated functions of bladder's mucous membrane. It is known that characteristic acute or chronic inflammatory changes of the MU of the gallbladder's mucous membrane have specific histotopography depending upon the form of cholecystitis. That is to say that in acalculous cholecystitis alterations of the microvasculature as well as various reological disturbances were observed in the deep capillary net located in the mucous membrane. In calculous cholecystitis analogous changes in the microcirculatory unit (MU) were observed in the subepithelial hemo- and lymphocapillary net. These changes may alter mucosal concentration function contributing to lithogenesis.

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LAMPERTI, Albert A., Thomas A. MARINO* and Marvin SODICOFF*. Department of Anatomy and Cell Biology, Temple University School of Medicine, Philadelphia, Pennsylvania, USA. Evaluation of computers in the Anatomy curriculum for first-year medical students.

Computer technology can alter the delivery of anatomical facts and concepts. Over several years we developed optional material in our Histology, Neuroanatomy, Embryology and Gross Anatomy courses. Recently, we incorporated faculty-produced computer programs more comprehensively into our curriculum. We taught part of our Histology course in the computer center where students could study tissue sections with both glass slides and microscopes guided by unlabeled computer images obtained from their own slide set. Small groups of 2-4 students used both computers and microscopes for a group learning experience that involved labeling the images on the computer. Approximately 50% of the students thought that the labeling exercise was helpful and over 90% thought that the combination of microscopes and computers was helpful. In Neuroanatomy, we replaced glass slide labs and required students to study all but the gross brain on computers. After each lab, students and faculty (30:1) met for review. Faculty agreed that this allowed for more sophisticated discussion with the students. Ninety percent of the students rated the labs as excellent/good. All lectures in Embryology were given within the framework of a Powerpoint presentation in which images and animations are organized. The presentations were placed on the library computers so that students could either preview or review the material. We found that 50-70% of the students used the material as an adjunct to their study. Examples from each of the 3 programs (generated on Powerpoint or Toolbook) will be demonstrated.

LAZAROVA* Dobrila and Gordana PETRUSEVSKA*. Institute of Anatomy, Institute of Pathology, Medical Faculty, Skopje, Republic of Macedonia. (sponsored by D.O. Graney) Morphology of the atrioventricular node of the heart conducting system.

As a result of numerous interesting investigations of the morphology of the A-V node, two unsettled questions have emerged: (1) whether there is a system of dual transmission in this region and (2) the nature of the slight delay in conduction observed in or near the A-V node. This is a report of cytological observations on the A-V node with attention to those structures that could contribute answering the previous questions. Thirty hearts from the human subjects were cytology studied. A block of tissue which extended from the noncoronary sinus of the aorta to the epicardium of the crux of the heart was removed. A variety of stains was employed but the most useful proved to be hematoxylin-eosin and Masson trichrome. Careful study of the cytology of the A-V node indicates that this structure contains different types of cells that are organized in a very

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characteristic manner : (1) An external cellular zone (mantle) which is made of cells with terminal contacts and possessing prolongation direct towards the center of the node. (2) A central zone (nucleus) made up of star-like cells with prolongation going in all directions. (3). A lower zone in which the cells are oriented in parallel manner and which in fact constitutes the intra-nodal portion of the common His bundle. The distal parts of the nodo-nodal pathways are in close contacts with the cells of the mantle of the A-V node. Because of the profuse interconnections of the normal A-V node cells, the suggestion is made that the slight delay in impulse conduction observed in this region may be a multiple cancellation effect within the node .

LEE, Robert E., John A. McNULTY*, Elaine P. LEE*, James R. Kennedy and M.F. DAUZVARDIS*. Department of Cell Biology, Neurobiology and Anatomy, Department of Pathology, Department of Surgery, Stritch School of Medicine, Loyola University Medical Center and Hines VA Hospital, Maywood, Illinois, USA. Problem-Based Learning (PBL) strategies in a restructured Basic Science Curriculum.

For two years, the restructured first year curriculum has included an 11 week Structure of the Human Body course that includes Gross Anatomy. Applications of Problem-Based Learning (PBL) methodologies have broadened learning of structure, variations, anomalies and pathology. A total of 260 medical students and seven graduate students studied 62 cadavers. Contributing features included Case-Based Studies, previously designed standardized recording forms for variations, anomalies and pathology and a heart weight exercise. PBL topics were based on cause of death information accompanying cadavers or observations and interests developed during dissection. Faculty approved student topics were presented by groups of 4 or 5 students to larger groups of 20-25. Brief, referenced written reports were required. PBL topics were based on Death Certificate information (18/62=29%) or observations during dissection (45/62=73%) and included portal hypertension, abdominal aortic aneurysms, total knee arthroplasty, polycystic kidney disease, keratoplasty and the pacemaker. PBL topics, presented later in the course, are positive focal points to correlate normal anatomy with observed significant variations and pathology. Test scores, written and practical, have not substantially varied from the years prior to the curriculum revision.

LOUKAS* Marios and Chris DIMOPOULOS* Department of Human Anatomy Warsaw Medical School and Department of Applied and Clinical Physiology Warsaw Medical School, Warsaw, Poland. (sponsored by D.O. Graney) Students' reactions and emotions, during cadaver dissection.

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First year students at the medical academy of Warsaw, on the occasion of their first exposure to cadaver dissection has revealed that a problem exists with respect to negative feelings and emotions. Their responses were undertaken in a questionnaire and 9 questions were selected. A total of 800 students in the first year of their medical studies at our school participated in the research. The following questions founded statistically significant ($P < 0.05$) by "t" test. The question regarding students response to first visual exposure to the cadaver yielded 17.5% fear, 18.6% disgust, 17.2% sadness and 22.5% surprise, while 13.6% reported repulsion as their first reaction. 20.5% of them expressed preference for the idea of using an artificial cadaver. 61.9% admitted that they would be influenced by their contact with the cadaver. 74.6% of the students responded that the dissections would play a significant role in their career. 68.4% of the sample expressed themselves to be unwilling to donate their bodies postmortem to the medical academy as a cadaver. A decrease in negative response was observed and emotions to the cadaver were modified. Thus a psychological defense mechanism is indicative in the students adaptation to the perceived threat of cadaver dissection.

LOZANOFF, Scott, Beth LOZANOFF*, David MOODY* and Martin STOCKWELL*. Department of Anatomy and Reproductive Biology, University of Hawai'i at Mānoa, Honolulu, Hawaii, USA., University of Alberta, Edmonton, Alberta. and Cowichan District Hospital, Duncan, British Columbia, Canada. Animating anaesthetic procedures with QuickTime: An example using the superior laryngeal nerve block.

Superior laryngeal nerve anaesthesia is frequently used to facilitate endotracheal intubation in the awake patient. However, the distribution of the anaesthetic is difficult to visualize due to the complex anatomical arrangement of the paraglottic space and communicating its distribution becomes problematic in an instructional setting. The purpose of this project was to animate a typical superior laryngeal nerve block so that the procedure could be visually represented thus facilitating conceptualization by students learning the technique. A superior laryngeal nerve block was performed on 20 cadavers at autopsy and fixed cadavers substituting 0.02% methylene blue for a local anaesthetic. The dye was consistently located within the paraglottic space bounded laterally by the thyrohyoid membrane and thyroid cartilage, medially by the laryngeal submucosa, superiorly by the conus elasticus, inferiorly by the hyoid bone and anteriorly and posteriorly by the anterior and posterior thyrohyoid ligaments respectively. Twenty-two sequential illustrations of the anaesthetic's distribution were rendered, scanned and imported into QuickTime movie maker. The animation permits the student to move the needle into the paraglottic space and inject the anaesthetic which then infiltrates the region. As a result of this animation, students can control the rate of injection

and easily visualize the distribution of the anaesthetic thus providing an effective means of instruction.

MacPHERSON, Brian R., David PECK, Kathryn M. WONG*, Derek EGGERS* and Duane HEADWORTH Department of Anatomy and Neurobiology and University Arts and Photography, University of Kentucky Medical Center, Lexington, Kentucky, USA. A dissection-based multimedia tutorial for the perineum.

The perineum is a clinically important region that is difficult to dissect. If no laboratory accompanies the course it is extremely difficult to understand. The area is frequently approached by pelvic hemisection and/or the use of perineal prosections. Teaching personnel shortages, exacerbated by deteriorating prosections, has forced us to investigate alternative, more time-effective and interactive methods. We are developing a computer-based perineal tutorial that allows the students to select one of 4 dissection levels, in sequence or randomly. Each level is accompanied by a labeled line diagram and comprehensive descriptive text. A self-evaluation module provides feedback. The 3 dimensional features of the region are effectively conveyed by tilting each dissection as much as 60° to the left or right and up to 60° from the inferior aspect of the urogenital diaphragm. Each level was photo-graphed digitally at 5° increments using a *Magellan 1000*® QuickTime VR® Object Rig. QuickTime VR® Object Digitizing software and RealVR® Xtra organized the images into a plug-in to Macromedia Director® that stands alone on CD ROM or can be distributed on a web-based platform. This tutorial, coupled with access to the resulting plastinated prosections and progress-assessing feedback, will provide a rich multimedia environment that stimulates independently-paced learning.

MacPHERSON, Brian R., James G. TIEMAN* and Robert F. RUBECK*. Departments of Anatomy and Neurobiology and Academic Computing in Medical Education, University of Kentucky Medical Center, Lexington, Kentucky, USA. Effective use of the Internet for curricular materials.

The expanding availability and ease of access to the World Wide Web (Internet) allows students to utilize electronically-based lecture and laboratory materials independent of specific hardware and in a format that can be easily and quickly modified to include emerging interactive Internet technologies. Using the "frames" capability of Netscape Navigator®, a browser window has been developed that is organized into four distinct areas: 1) a header area for lecture identification and user orientation, 2) a topic index area which with lab materials can also display image thumb-nails for rapid visualization of the entire contents of the session, 3) a content area that displays lecture material with line diagrams and laboratory images with corresponding descriptive text, as well as the ability to

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navigate between frames, link lecture and lab materials as well as request enlarged images and 4) a footer area with links to the course table of contents, an online e-mail question forum, access to a session or whole course search engine and other related web sites for the topic. This template is easily modified to accommodate various types of visually-based curricula. The numerous educational outcomes for this type of instruction indicates that this approach to providing materials for student learning holds great promise. It allows ready access to institutionally-generated materials as well as the ability to instantly incorporate adjunct materials available elsewhere.

MANOUKIAN L. A. Department of Anatomy, Yerevan State Medical University Yerevan, Republic of Armenia. (sponsored by D.O., Graney)
Microcirculation in synovial membranes of the talocrural joint sinew.

As it is known, the area of talocrural joint in the greater degree as others ones is subject to various injuries inflammation processes which lead to disablement. Inflammatory conditions such as tendovaginitis, phlegmonous, and tendoburents are well-known to the physicians. We were interested in the vascularization of synovial membranes in the foot in relationship to reconstructive surgery. The macro-microscopic methods used in the study involved injecting the vessels with different colored agents. We used tissues from 40 human cadavers, both male and female of various ages, who died of casual injuries. The results of our investigations showed that normal function of synovial vagina is related to the particular capillary nets with different thickness. The vessels are spread irregularly inside the walls of all the synovial vaginas. The thickest nets and capillary loops were placed on the edge of synovial membrane with the lateral walls of the osseous fibrotic channel. Considerable avascular areas were marked in the places which were subject to the most pressure and friction. The synovial membranes take place in the following order: capillaries, post-capillaries and venules, reach the layer of covering cells and the larger vessels are on the external layer transform of parasynovial cellular tissue. Capillaries form loops and bales, which are related to the secretion of synovial fluid. We have noted the prevalence of veins over arteries that suggest a discrepancy of the blood flow and tide. This change is the most principal one in the changes of the terminal vessels in inflammatory conditions.

MARTIN, William D. and Daniel CARTER* Division of Structural Biology, West Virginia School of Osteopathic Medicine, Lewisburg, West Virginia. The use of plastination polymer to produce a permanent demonstration of the space defined by Scarpa's and Colles' Fascia.

In previous years containment of extravasated urine by the membranous fascia of Scarpa on the anterior abdominal wall and Colles Fascia in the perineum was

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effectively demonstrated by injecting embalming fluid into the space between Scarpa's fascia and the deep fascia of the abdominal wall. This demonstration clearly showed the limits of the fasciae on the abdominal wall, the perineum and the upper thigh, however, it depended on having an unembalmed cadaver available at the appropriate time in the dissection schedule. To alleviate this problem a permanent demonstration has been prepared by injecting plastination polymer (S-10 resin with 1% S-3 hardener) to which we added 2% of liquid S-6 hardener. Thymol blue was added to provide some coloring. The mixture was injected into an embalmed cadaver using a 100 ml syringe and large bore needle. After the polymer hardened the specimen was processed through alcohol to remove phenol and glycerine used in the embalming fluid, washed in water, dehydrated in acetone and impregnated with S10 polymer under vacuum at -20°F. The specimen was then gas hardened and sectioned sagittally to demonstrate the space defined by Scarpa's and Colles' fasciae.

MOODY*, David and Scott LOZANOFF. University of Alberta, Edmonton, Alberta, Canada and University of Hawaii, Honolulu, HI. SURFdriver: A practical computer program for generating three-dimensional models of anatomical structures using a PowerMac.

Few computerized learning systems have incorporated three-dimensional anatomical reconstructions since a simple technology to generate these models has not yet been developed. The purpose of this paper is to describe a simple and inexpensive computer program, called SURFdriver, for generating three-dimensional anatomical models. The program requires 4 MB of RAM and uses PICT file Images. SURFdriver includes a data entry program using an edge detection algorithm facilitating automatic edge extraction. Reconstructions can be incorporated into existing programs, e.g., Quick-time VR, in order to visualize and manipulate the anatomical models. Using the Visible Human Data set, edges are automatically detected for relevant tissues providing contours. Polyhedral volumes are constructed between planar contours and surfaces are interpolated, displayed and rendered. SURFdriver enables numerous viewing options including contrast adjustment, surface reflection and opacity lighting as well as viewing tool options such as snapshot saves, Quicktime VR movie production, multiple rotational modes and DXF model export. This system is being used both in basic research to model growth changes in the craniofacial complex as well as a computer-aided learning package to supplement gross anatomy instruction. (Supported by a University of Hawaii Seed Money Award)

MORIGGL*, Bernhard, Institute of Anatomy, University of Innsbruck, Austria (sponsored by S. POISEL). Anatomy and sonography of the scapular notches Suprascapular nerve entrapment at the scapular- and "spinoglenoid" notch is a

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rare but well known cause of shoulder pain. Only recently, the use of MRI to image morphological changes at these critical sites has been established. This study aims at evaluating the potential benefits of ultrasonography as an alternative imaging tool. 286 macerated adult scapulae were analysed with special attention to the shape of the scapular- as well as the spinoglenoid notch. Additionally, an investigation concerning the transverse scapular ligaments (superior and inferior) by dissection of 122 cadaver specimens was conducted. Following the results of a pilot study in 15 healthy test persons using different scanners and frequencies in the same individual, another 97 volunteers (aged 18-39) underwent bilateral shoulder sonography with 7,5 MHz-scanners (linear and sector) to show the scapular notches. As to the shape of the spinoglenoid notch, four different patterns were noted during the scapular study, whereas the scapular notch, although of considerable variability, showed five basic types. The latter is comparable to what was reported previously (Vallois 1926; Barbosa-Sueiro 1928; Hrdlicka 1946). All types of notches as mentioned above could be identified by means of ultrasound too. Moreover, a superior transverse scapular ligament bridging the notch showed up in the majority of cases. In contrast, the inferior transverse scapular ligament was detected in 54% of cases. Finally, ultrasound constantly revealed a characteristic texture of echoes within the indentations which was defined as "normal". Sonographic imaging of both, the scapular- and "spinoglenoid" notch has gone unnoticed so far. As presented in this study, ultrasound is capable of evaluating the outlines and normal appearance of narrow passes in the scapular region. Thus, it opens up new aspects in non-invasive diagnosis for the differentiation of shoulder problems.

MYERS*, Robert P., Bernard F. KING* and Donald R. CAHILL, Departments of Urology, Radiology and Anatomy, Mayo Clinic, Rochester, Minnesota. Deep perineal "space" as defined by magnetic resonance imaging.

Magnetic resonance imaging (MRI) was used to examine the deep perineum in 15 men. Sequential axial, sagittal and coronal T-2 weighted fast spin echo images were acquired. We did not observe a urogenital diaphragm as traditionally depicted. Thus, we see little basis for terming that part of the urethra between the apex of the prostate and convex superior surface of the corpus spongiosum the membranous urethra. Further, in these living subjects, a readily identifiable perineal membrane was located only inconsistently. The inferior part of the levator ani musculature has a "teardrop" shape in the coronal plane where it is juxtaposed to the prostate. An external striated urethral sphincter flanked the urethra and extended upward to occupy the gap (urogenital hiatus) between the free margins of the levator. Adipose and vascular tissue of the anterior recess of the ischioanal fossa extended along the sides of the inferior portion of the external

striated urethral sphincter. The traditionally described, deep perineal space, was not found.

NAGY, Frank*. Department of Anatomy, Wright State University School of Medicine, Dayton, Ohio, USA. (sponsored by M. Hines). The Elements of a Successful Anatomical Gift Program.

The Anatomical Gift Program was begun at Wright State University School of Medicine (WSUSOM) in 1975 and now numbers nearly 9000 registrants. We believe that several factors contributed to this strong growth despite our proximity to two long-established and distinguished medical schools. First, the philosophical and financial support from the SOM administration was and continues to be, extraordinarily strong; this has enabled the implementation and continuation of elements in our program not present in many others. Second, we devoted significant amounts of time during our inception to educate and inform the public about our program. Efforts continue in this venue but on a more limited basis because of our initial successes. Third, it is important to posture a program such as this to provide educational material for purposes other than ordinary dissection by medical students. Postgraduate medical education seminars and workshops must be initiated and administered by the anatomical gift programs to facilitate additional use of the available material. As an extension of this, a fourth factor for success is to make potential donors aware of the myriad ways a donation benefits society and the health of future generations; this encourages donation. Finally, a fifth requirement is to offer survivors of the donors a range of services while exhibiting sensitivity, compassion and flexibility.

NAH Seang-Hoo. Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia. The Digital Hand: an interactive multimedia courseware on the functional anatomy of the hand

Most medical students lack the dissecting skills to explore the anatomy of hand effectively. They therefore usually encounter great difficulty trying to visualise the three-dimensional relationships of the many structures found in the hand. They also get confused trying to understand how all these structures work in tandem to impart the high degree of manual dexterity that is unique of the hand. It was with the aim of trying overcome these difficulties that "The Digital Hand" was created. Hand drawn line graphics were digitized and subsequently colorized and sequenced to produce animations using the software "Director". "The Digital Hand" is a multimedia, an highly interactive, modular courseware suitable for both large group lecture situations, for small group learning and also for individualized learning where the user is given the control of pacing himself. The functional approach was taken while developing the courseware and integration of structure and function was emphasized. The visualization of the 3-dimensional

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relationship of the many structures found in the hand is facilitated by animating the sequential overlaying of structures from deep to superficial using the multilayering technique. There are also hypertext links to pathological situations and interactive self-assessment exercises at the end of every module. The Digital Hand has already been used in small group situations with favorable responses from the students. (Sponsored by Grant #F277/1996)

NAH Seang-Hoo and Krishnan SUBRAMANIAM, Department of Anatomy, Faculty of Medicine, University of Malaya, Kuala Lumpur, Malaysia. The effectiveness of a clinically-orientated student teach-learn program on student performance in the gross anatomy course.

In a major effort to do away with all forms of didactic methods of teaching, the Faculty Curriculum Committee, in 1996, announced the compulsory reduction of lecture hours by 50% for all basic science disciplines. It was left to the respective departments to find ways to motivate student self-learning. Under such circumstances this department introduced a Clinically Orientated Student Teach-Learn (COSTL) Program which centered around carefully selected clinically-relevant topics packaged as 12 Self-Directed Learning (SDL) Seminar Instructions and 8 Correlative Clinical Anatomy (CCA) Tutorial Guidelines. The COSTL Program was designed to thrust the major responsibility of teaching into the hands on the students themselves being confident on the premise that any student who is forced to teach will invariably have to learn. The Program also promoted learning in small groups, focussed discussions during dissections and group responsibility for learning. The lecturer's role receded to that of a facilitator. The impact of the COSTL Program was evaluated by comparing student performance with those of the previous year where teacher-centered learning activity was dominant. Identical assessment tools were employed. Students under the COSTL Program performed significantly better ($p < .05$) in the practical examination and clinically orientated questions. There was no appreciable improvement in the MCQ component between the two groups. In conclusion the COSTL Program has successfully improved the effectiveness of students' learning of gross anatomy.

NEMITZ, James W., Daniel CARTER*, Robert M. FISK*, William D. MARTIN and James P. WELLS*. West Virginia School of Osteopathic Medicine (WVSOM), Division of Structural Biology, Lewisburg, West Virginia, USA. Ten years of experience conducting an anatomy enrichment program for high school and allied health students.

The Gross Anatomy Staff at the WVSOM has been conducting a community service program to enhance science education in West Virginia for over ten years. The program consists of a two hour presentation of gross anatomy to advanced

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biology high school, allied health and college students who are studying anatomy but do not have access to human cadaver specimens. In addition to demonstrating anatomy, the program also conveys information about osteopathic medicine; health and wellness issues; the cadaver donor program; biomedical sciences; and the WVSOM. The format of the program includes an orientation lecture typically followed by four demonstrations of anatomy which have included: an undissected embalmed cadaver for explaining embalming procedures; a prosection demonstrating thoracic and abdominal anatomy; a presentation on aspects of the nervous system; a prosection demonstrating either upper or lower limb anatomy; and a demonstration of plastinated organs. The response to this science enrichment program has been extremely positive. Since 1987 the number of participants has increased by 10 fold even though the program has not been advertised except by participants. Student evaluations indicate that it is well received and contributes to their study of anatomy. The program benefits the WVSOM in terms of being a valuable community service project that results in positive public relations, both locally and regionally, with political and recruiting benefits. Problems that have been encountered with the program include: increasing demand for the program; logistical concerns; staff schedule conflicts; inappropriate participant behavior and fainting of participants. (Sponsored by the WVSOM, a state supported institution of the University of West Virginia System.)

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NIIRO*, Nobuhiko, Keiichi AKITA*, Gen MURAKAMI*, Seiichi ISHII* and Tatsuo SATO. Department of Anatomy, Department of Orthopedic Surgery, Sapporo Medical University, Sapporo, Department of Anatomy, Tokyo Medical and Dental University, Tokyo, Japan. A morphomechanical study of the elbow joint with special reference to the contact area between the radial head and the capitulum of the humerus.

Although many studies have reported that degeneration in the elbow joint frequently occurs from the humero-radial joint cartilage, few have investigated the width of the humero-radial joint space and the contact areas between the humerus and the radius. Resin casts of the humero-radial joint cavities of one hundred joints of 86 Japanese cadavers were made with fully extended elbows in pronation, intermediate position and supination. The articular surfaces of the radial heads were also observed macroscopically to determine the degree of the degeneration. We measured the thickness and the area of the casts and estimated the width of the joint space and the ratio of the contact area to the whole surface with the aid of a computer. The joint space width was narrow at the medial zone in supination. As the forearm was pronated, the joint space width was considerably reduced and the contact area was expanded towards the posteromedial zone. The degree of the degeneration was more severe in the anteromedial zone than in the posterolateral zone. The contact area correlated with the degenerated area. These findings provide a better understanding of the mechanism of the development of osteoarthritis in the elbow joint.

NORTON*, Neil S., James R. McCONNELL* and Jorge F. RODRIGUEZ-SIERRA*. Department of Oral Biology, Creighton University School of Dentistry and Departments of Radiology and Anatomy, University of Nebraska Medical Center, Omaha, Nebraska, USA (sponsored by M. E. Jergenson). A morphometric analysis of hippocampal neurodegeneration in thioacetamide induced fulminant hepatic encephalopathy (FHE) in male rats.

Fulminant hepatic encephalopathy (FHE) is a clinical syndrome characterized by a number of neuropsychiatric and motor disturbances seen in patients with liver dysfunction. One region of the brain which plays an important role in cognitive function is the hippocampus. The purpose of this study was to investigate whether degeneration in the hippocampus occurred in rats with FHE. Male rats were administered thioacetamide (600 mg/kg) via i.p. injection at hours 0 and 24 and allowed to progress into the four Stages of FHE. Control rats received a saline vehicle at the same times. Quantitative morphometric analysis was used to examine the severity of the damage to the hippocampus using a cell counting procedure. The first section was taken at -2.3 Bregma. The next two sections were taken at 50 μm intervals following the first and stained with hematoxylin and eosin. The number of normal and pathological pyramidal cells in the CA₁-CA₄ sectors was analyzed by

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projecting the sections at a magnification of 100X onto a transparent test lattice using a microscopic image projector and counting the number of normal and pathological pyramidal cells in the section. The results were expressed as the percentage of normal or pathological neurons/mm² based on the total number of neurons counted. A one-way analysis of variance (ANOVA) with a Newman-Keuls post-hoc test was performed to evaluate the statistical differences between groups. No changes in the structural integrity of the pyramidal cells were noted in controls. Neuronal damage was observed in the CA₁ and CA₂ regions of the hippocampus. The CA₁ region displayed pathological changes in Stages III and IV ($p < 0.05$). The damage in the CA₂ region was only observed in Stage IV. In the CA₃ and CA₄ regions, no pathological changes were observed. These results suggest that necrotic changes occur in the pyramidal cells of the CA₁ and CA₂ regions of the hippocampus in the final stages of FHE in rats.

OHNO, K., H. SHIMA, K. MICHII, K. EGASA*, I.L. TAKIGUCHI*. First Department of Oral and Maxillofacial Surgery, First Department of Oral Anatomy, School of Dentistry, Showa University, Tokyo, Japan

Anatomical study of vascularized bone grafts for mandibular reconstruction

Various types of vascularized bone graft have recently been used for mandibular reconstruction following resection of oral cancer. Dental implants have also begun to be used in reconstructed mandibles to facilitate recovery of masticatory function. However, there are few clinico-anatomical studies in which various bone materials used for mandibular reconstruction were assessed with respect to their fitness to implants. The present study was undertaken to anatomically assess various bone grafts used for mandibular reconstruction and the residual mandibular bone which receives the graft. From 27 Japanese cadavers (27 sides of the body) fixed under the same conditions for anatomical training, the iliac bone, the scapula, the fibula, the rib and the mandible were removed for the present study. The vertical and horizontal dimensions of each bone and the thickness of the cortical bone layer of each bone were measured using slide calipers. The vertical diameter was largest for the iliac bone (46.3 mm). It was 19.1 mm for the scapula, 14.7 mm for the rib, 12.7 mm for the mandible and 26.1 mm for the mandible. The horizontal diameter was largest for the iliac bone (14.6 mm). It was 11.0 mm for the fibula and scapula, 6.4 mm for the rib and 12.6 mm for the mandible. The cortical bone thickness was largest for the iliac bone (2.6 mm). It was 2.4 mm for the scapula, 1.0 mm for the rib and 3.8 (0.87) mm for the mandible. These findings indicate that the iliac bone is most suitable for mandibular reconstruction in cases where the use of implants is planned. Some special devices are needed when the scapula or the fibula is used in combination with implants. It seems difficult to use the rib combination with implants.

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PARKE, Wesley W., Harry E. SETTLES, Paul C. BUNGER*, Suliman SAID*, Department of Anatomy and Structural Biology, University of South Dakota School of Medicine, Vermillion, South Dakota, USA. Lack of vasa vasorum and probable cerebrospinal fluid nutriment of outer layers of spinal intradural arteries.

The larger intradural arteries of the radiculospinal circulation, unlike extradural vessels of equivalent size, possess no nutritive vasa vasorum. Microvascular injections in nine human and four dog spinal cords showed only a vasa vasorum forming a plexiform cuff surrounding four to eight millimeters of the first intradural section of the larger medullary arteries. These were regarded as ancillary sites for absorbing cerebrospinal fluid (CSF) into the venous system. As the remaining intradural vessels were devoid of the demonstrable vasa that supply nutrition to the tunica adventitia and external tissues of the tunica media in equivalent sized extradural vessels, the anterior spinal artery (ASA) and its larger medullary feeders were examined by light and scanning electron microscopy (SEM) to determine the source of metabolites to the outer aspects of these vessels. The SEM showed that the pia-arachnoid surrounding the vessels was a gauze-like covering that permitted the free percolation of the CSF to the adventitia. In addition, SEM views of oblique end-sections of the ASA wall showed the adventitial layer to have a perforated surface and spongiform construction that would promote penetration of CSF to outer strata of the media. It was concluded that the CSF, as it does in the radicular tissues, provides a source of nutriment to the exposed layers that could be compromised in the event of arachnoiditis.

PARRY*, Robert L. and Gary WIND, Departments of Surgery, The National Naval Medical Center, Bethesda, Maryland, Walter Reed Army Medical Center, Washington, DC, USA and The Uniformed Services University of the Health Sciences, Bethesda, Maryland. Anatomy through the power of today's desktop computer.

The art and science of anatomy involves the cohesive transfer of a three dimensional representation of the human form from one individual to another. Many teaching methods and media are used to pass on this information, from cadavers and operative experience to the written word. The illustrating and publishing tools used to create and distribute this knowledge were relatively static until the development of the computer over the past twenty-five years. An imaging revolution is now occurring as our ability to easily represent objects in three dimensions becomes a reality. Moreover, the ability to distribute this information is changing radically with the creation and maturation of the internet. Reviewed here are some of the new media opportunities available using today's powerful desktop computers. With minimal to moderate investment, a

single user with average computing experience can now create and / or obtain detailed two and three dimensional images and multimedia productions. Video presentations combining graphics, video and 3-D models can now be produced on the desktop computer within a department. This information can be distributed and obtained via the internet in an efficient manner. Hardware, software and technical requirements are evaluated and reveal the ability of today's desktop computer to deliver a new world of anatomical education.

PAWLINA, Wojciech, Kyle. E. RAREY, Lynn J. ROMRELL, William A. DUNN* JR., Richard RATHE* and Nancy S. HARDT* Departments of Anatomy and Cell Biology, Community Health and Family Medicine and Pathology and Laboratory Medicine, University of Florida College of Medicine, Gainesville, Florida, USA. Increasing awareness of women's health issues in early pre-clinical medical curriculum.

Recent changes in medical school's curricula, including the University of Florida College of Medicine (UFCOM) have lead to more clinically-oriented teaching in basic science, as well as providing early clinical exposure through primary care preceptorships to first year medical students. Facts emphasized in gross anatomy and microscopic anatomy courses form the foundation for such early clinical experiences. In the last five years basic science courses at UFCOM have undergone marked changes to become more clinically oriented. The major changes related to gross and histology courses included: 1) the integration and correlation of topics presented in histology, cell biology and gross anatomy courses, 2) emphasizing the importance of a basic science knowledge through the use of clinically oriented problems during the lectures and laboratories, 3) increase interaction with clinical teaching faculty (pathologists, surgeons, internists), residents and senior medical students, 4) introduction of breast and pelvic examination in the basic clinical skills course, 5) the modification of written and practical examinations by using more clinically relevant questions. In addition grand rounds were implemented to present patients with clinically relevant diseases. During this process, in each basic science course, when an appropriate basic science topic was discussed, the relevant women's health issues were emphasized. The histology course employed several pathological slides (including breast cancer, PCO syndrome and Pap-smear) into the regular laboratory exercises. The invited pathology faculty discussed the importance of pathological examination on the diagnosis, treatment and prognosis of frequent women's health problems. During gross anatomy lectures on pelvis and perineum, multiple case studies were incorporated into the lectures and syllabus to stimulate interest of common woman's health issues. During the grand rounds topics related to women's health (breast cancer, infertility, pregnancy) also were included. The faculty and the students believed that implemented changes in the curriculum

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increased the awareness of woman's health issues early in the training of medical students.

PETTERBORG, Larry J. Department of Pathology and Anatomical Sciences, University of Missouri School of Medicine, Columbia, Missouri, USA. Teaching gross anatomy in a changing curriculum: where are we going?

Four years ago we began a curriculum based on small group teaching, early clinical experiences and a reduction in basic science lectures and labs. Each of the subsequent classes has had a experience in anatomy from no dissection to dissection of the whole body superior to the inguinal ligament. In an attempt to gauge where our curriculum is relative to other medical schools, a survey was sent to 118 medical school departments responsible for teaching human gross anatomy, 73 responses were returned (62%). Although 73% of the respondents indicated there had been significant alterations in curricula or changes are expected, dissection and lecture based gross anatomy courses were still the rule (92%). The four major changes reported were the addition of PBL (23%), loss of time (16%), integration of the basic sciences (12%) and the addition of clinical experiences and correlations. Sixty-seven percent of departments use computer programs to some degree in teaching anatomy. The most utilized programs are developed by individual departments, A.D.A.M. and the Gold Standard series. Dissection was indicated as essential to the teaching anatomy by 82% of the course directors and department chairs returning surveys. Another 12% said dissection was very important while one person felt that dissection was only slightly important. Respondents expressed grave concerns over the minimization of anatomy in medical school curricula. At Missouri we offer a limited dissection experience early in the curriculum supplemented with clinical anatomy in the PBL cases and clinically oriented anatomical electives in the fourth year.

PHINNEY, Alexi J., Richard A. BERGER and Stephen W. CARMICHAEL. Mayo Medical School Department of Anatomy and Department of Orthopedics, Mayo Clinic and Mayo Foundation, Rochester, Minnesota, USA. Extensor pollicis longus tendinitis.

Extensor pollicis longus (EPL) tendinitis can be debilitating, but is infrequently detected and is often refractory to conservative treatment. Little is known about the anatomy of the EPL musculotendinous system. Thirty paired adult cadaver specimens were carefully dissected to evaluate the anatomic characteristics of the EPL tendon, tendon sheath, extensor retinaculum compartment and pertinent adjacent structures. In-vivo measurements of the tendon angle relative to the radius were made on twenty healthy adult volunteers. The mean tendon length was 13.4 centimeters, including the extensor hood that alone had a mean length of 4.3 centimeters. The mean angle of the tendon in the coronal plane was 28

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degrees; the average parasagittal plane angulation was 39 degrees. The average distance of the muscle belly from the proximal end of the third compartment was 6.2 millimeters. Eight of forty-one specimens showed muscle incursion into the third compartment (range: two to seven millimeters). The average tendon excursion was 13.2 millimeters. Microsurgical dissection revealed a bursal sac extending from the musculotendinous junction to the base of the first metacarpal. Thirteen out of fourteen specimens had a verifiable communication between the bursal sacs of the second and third extensor compartments where the EPL crosses the radial extensors. Speculation on the pathogenesis of non-traumatic, tendinitis-associated spontaneous rupture of the EPL was made in light of our findings. (Sponsored by Mayo Medical School and Grant No. 098495 from the Mayo Department of Orthopedics.)

PIETRASIK, Kamil M., Aleksandra KWOLCZAK*, and Bogdan CISZEK*. Department of Human Anatomy, Warsaw University Medical School, Warsaw, Poland. Vascularization of the scapular spine - preliminary study.

Both, lateral and medial margins of the scapula are widely used as bony component of compound microsurgical flaps. In our study we focused on vascularization of the scapular spine as a potential donor site for compound tissue transfer. We began our work on this subject with an evaluation of the frequency and size of nutrient foramina for the vessels supplying this part of the scapula. We found this preliminary investigation to be very helpful in further cadaver dissections. 70 macerated human scapulas were measured with the aid of standard anthropometric equipment and computer image analyzing system. All foramina for the vessels supplying scapular spine were measured in three compartments: I-subscapular fossa, II-supraspinous fossa, III-infraspinous fossa. The biggest number of foramina, 155 (42,2% of all foramina /o.a.f./) was present in supraspinous fossa, the middle, 129 (35,1% o.a.f), in subscapular fossa and the smallest, 83 (22,7% o.a.f.), in infraspinous fossa. The most frequently present number of foramina in particular compartments was also calculated. In supraspinous fossa 2 foramina, in infraspinous fossa 1 foramen and in subscapular fossa equally 1 or 2 foramina were most frequently present. Diameters of all the foramina were measured and the means were evaluated. Based on this values, all foramina were classified as „dominant”(one with biggest diameter) and „accessory” (remaining ones) for every of three compartments. Dominant foramen in supraspinous fossa most frequently had 1,5 mm in diameter, in infraspinous fossa 1,0 mm in diameter and in subscapular fossa 1,25 in diameter. Measurements of the distances between foramina and compartment-specific orientation points were performed. Based on all accumulated data areas of most frequent presence of the „dominant” foramen and its diameter were

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established. Following these anthropometric studies, the first five cadaver scapulas were dissected.

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PIETRASIK, Kamil, Pawel ZDUNEK*, Leopold BAKON*, Piotr M. DOBOSZ, and Adam KOLESNIK. Department of Human Anatomy, Warsaw Medical School and Department of Pathology, The Children's Memorial Health Institute, Warsaw, Poland. Clinical anatomy of the internal mammary artery. A morphologic and morphometric investigation.

Progress in almost all cardiac-surgical procedures, especially in the adults, stimulated many authors for search of sufficient blood sources e. g. for coronary artery by-pass grafting. Together with left gastroepiploic artery the internal mammary artery (IMA) is one of the most important by-pass arteries. Furthermore, in plastic and reconstructive surgery IMA serves as recipient vessel in breast reconstruction by free rectus abdominis muscle flap. All these procedures need extremely detailed preparation of the IMA. Due to this fact we decided to perform a morphologic and morphometric examination of 33 IMAs (right - 17, left - 16). Observations and measurements were made with the aid of operating microscope. We described the origin of the trunks and solitary branches of the IMA dividing its lumen in quarters. According to their course, we distinguished 7 types of all IMA branches (sternal, perforating, intercostal, sternal-perforating, perforating-intercostal, sternal-intercostal and sternal-perforating-intercostal). In addition, the distribution of all IMA branches in the intercostal spaces was evaluated. From morphometric point of view, we measured diameter of the trunks and solitary branches (at the points of their origin) and length of the trunks. Processing of collected data shows: 1. Most common types are sternal (34,95%), intercostal (32,18%) and sternal-perforating (9%); 2. Other types occurred less than 7,3% of all arteries; 3. Average diameter of the trunks and solitary branches was 0,73 mm (min. 0,1 mm, max. 2 mm); 4. Direction of the branches course (in quarters) was: anterior - 40,48%, lateral - 30,10%, medial - 28,37%, posterior - 1,04%. Comparing the data, it is extremely interesting that the sternal and intercostal branches are comparable in number. However, origin in anterior quarter is present in over 40% of all branches of which 57,26% is directed to the sternum. This fact may play a major role in the previously described complications in the recovery of the patients after medial sternotomy due to insufficient blood supply.

QUINN, T.H., T. MARTINEZ-SERNA*, C. J. FILIPI*, and T. TOMONAGA*, . Departments of Surgery and Biomedical Sciences, Creighton University School of Medicine, Omaha, Nebraska, USA. Surgical anatomy of the posterior short gastric artery in gastric fundoplication

Although the anterior short gastric arteries are usually mentioned in contemporary anatomical and surgical texts and atlases, the posterior short gastric artery (PSGA) is seldom discussed or depicted. The arterial supply to the gastric fundus is of particular interest to surgeons who use the Nissen fundoplication

procedure in the treatment of gastroesophageal reflux, since the fundus is mobilized and folded around the esophagus. We dissected the fundic and splenic regions in twelve cadavers following the methods of Suzuki. We noted the presence or absence of the artery, its origin, course and the probability of damage during fundoplication. We found that the artery was present in 66.6% of the cadavers. The origin of the PSGA was on average 6.16cm from the hilus of the spleen. The diameter of the vessel was approximately 2mm at its origin. The angle formed between the splenic artery and the PSGA was approximately 45 degrees. The initial half of the PSGA is deep to the posterior parietal peritoneum; the other portion of the artery runs in the gastrophrenic ligament and then superficially on the posterior fundus. We conclude that the PSGA should be identified in fundoplication if possible to avoid intra-or post-operative bleeding.

RODRIGUES, A.J. Jr., C.J. RODRIGUES* A.C.P. CUNHA* and W.E. MITTELSTAEDT*, Lab.Anatomia Médico-Cirurgica e Serviço de Cirurgia Geral HC-FMUSP., São Paulo - SP., Brazil. Quantitative changes in the collagen and elastic fibers of the fascia transversalis from patients with direct or indirect inguinal hernia.

Acquired direct inguinal hernias result fascia transversalis (FT) weakness at the Hesselbachs' area. There is some evidence that direct inguinal hernias may be related to hereditary or acquired defects in the collagen synthesis or turnover. RODRIGUES JUNIOR (1988, 1990) have shown an aging changes in the FT, where the oxytalan elastic fibers were reduced and the mature elastic fibers showed degenerations. These histomorphometrical and ultrastructural changes promotes weakness of the FT and may be the correlated to the high incidence of the groin hernia in the aged persons. In the present study we analysed the collagen content and linear density of the fibers of the FT from 57 patients, 21 with direct and 36 with indirect inguinal hernias. The FT followed histological procedures: for histomorphometrical study of the Linear Density (LV) of elastic fibers system, a 5 µm tick sections were stained with Verhoeff for mature elastic fibers, with Weigert with and without oxone, for elaunin and oxytalan fibers; for colorimetric determination of the collagen content, a 10 µm tick sections were stained with Sirius Red. Our results showed less amount of collagen in the FT from patients with direct inguinal hernia compared with FT from patients with indirect inguinal hernia. Furthermore, the FT from patients with direct inguinal hernia showed greater amount of mature elastic fibers and less amount of oxytalan elastic fibers, compared with FT from patients with indirect hernia. These results suggest and acquired defects in the collagen synthesis or turnover and degenerative changes of the elastic fibers system in the FT from patients with direct inguinal hernia.

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RODRIGUES A.J. Jr, C.J. RODRIGUES and I.L. TREVISAN , Lab.Anatomia Medico-Cirurgica (LIM-02) HC-FMUSP. Sao Paulo - SP. Brazil In vitro evaluation of fibroblastic response to different prosthetic meshes for abdominal repair.

The ability to produce an adequate fibroblastic response employing prosthetic mesh is controversial. Two-millimeter biopsy of the fascia of me rectus abdominalis muscle was obtained aseptically from a 47 year old man and placed in a culture dish with medium consisting of DMEM supplemented with 20% FCS and antibiotics (penicillin, fungizone and streptomycin). The specimen was left at 37 C in a 5% carbon dioxide incubator until fibroblast explants were detected. The specimen was subcultured employing thin or thick netting with or without stretch, placed in a culture dish containing similar medium. It demonstrated fibroblast growth into stretched mesh. The adherence of fibroblasts was seen within one day and fibroblasts begin to stretch across the mesh opening within 5-7 days. On the other hand no fibroblastic growth was seen into the not stretched mesh The thin mesh promotes better results because the fibroblasts migrate into the minute empty spaces along the edge of the material faster than the thick one. We concluded that meshes must be secured at the edges to promote fibroblastic integration.

RODRIGUES C.J. and A.J. RODRIGUES Jr. Hospital Universitario USP and Lab.Anatomia Medico-Cirurgica (LIM-02) HC-FMUSP, Cidade Universitaria, Sao Paulo -SP, Brazil. Evaluation of extracellular interstitial matrix components in prostate neoplasia.

Immunohistochemical studies to localize laminin, fibronectin and tenascin were undertaken in 20 prostates with benign prostatic hyperplasia and 15 with prostatic carcinoma, from, patients aged between 50 - 75 years old that were submitted to surgical treatment. These material were obtained from the archives of the Pathology Divisions of the Hospital Universitario USP. Sections from each paraffin block were stained with haematoxylin and eosin and by immunohistochemical methods (fibronectin, laminin and tenascin.) The benign prostatic hyperplasia showed a high reactivity for all these extracellular matrix components. The staining for laminin was often stronger at the basement membranes of the blood vessels and weaker at the basement membranes of the glandular acini and ductules, for the fibronectin the extracellular matrix reacted stronger in the in the interstitial stroma, the reactivity for tenascin was weaker but evident at the glandular epithelium and at the acinar and ductal basement membranes. The spectrum of these components of extracellular matrix in the prostatic carcinoma changes. All these extracellular matrix components showed loss of reactivity at the stromal or at the basement membrane in the prostatic

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carcinoma. These results suggest that neoplastic cells can't retain the capacity to synthesize and secrete basement membrane components and adhesion molecules.

ROHRS*, D. M., L. M. ROSS and K.E. STEPHENS*. Department of Anatomy, Michigan State University and East Lansing Orthopedics Assoc., East Lansing, Michigan, USA. Anatomy of the carpal tunnel in the female: carpal tunnel syndrome implications.

Previous studies of the carpal tunnel (CT) anatomy utilized predominantly male subjects, or the gender was not specified. Yet carpal tunnel syndrome (CTS) occurs predominantly in females. Thirty adult female cadaver wrists were dissected. Several variations from the usual anatomic descriptions were evident which might be contributory to CTS. Mean wrist depth/width ratio was 0.67; previous studies have suggested that ratios of <0.7 were correlated with medial nerve sensory latencies at the upper limit of normal. The motor (recurrent) branch of the median nerve had a high incidence of a transligamentous (43%), subligamentous (3%), or direct radial course to the thenar musculature (23%). Incursion of the flexor digitorum superficialis and/or the lumbrical muscle bellies into the CT also occurred more often than expected (37% and 30% respectively). If each of the above is considered a potential risk factor for CTS, only one specimen (3%) had no risk factors. Fourteen or 47% of the specimens displayed two risk factors, eight specimens (27%) displayed three risk factors, six specimens (20%) displayed three risk factors and one specimen had all four risk factors. Fourteen of the fifteen cadavers (93%) examined had risk factors present bilaterally. Five cadavers (33%) had two or more risk factors present bilaterally. In 13 cadavers (86%) the same risk factors were present bilaterally. Aberrant structures at risk at surgery included: palmar cutaneous and ulnar nerves and the flexor digitorum superficialis muscle.

ROSSE, Cornelius, Cliff SOLOMON* and Douglas C. SCHAAD*. Departments of Biological Structure and Medical Education, University of Washington School of Medicine, Seattle, Washington, USA. Assessment of Spatial Reasoning in Clinical Anatomy.

Computer displays of 3D anatomy could facilitate the development of spatial reasoning skills required for the physical exam, the interpretation of medical images and the performance of other diagnostic and therapeutic procedures. In order to teach and learn these skills, cognitive factors involved in anatomical spatial reasoning need to be identified and appropriate evaluation instruments need to be developed and validated. Before implementing them in the computer, we want to test the validity of anatomy-related, paper-and-pencil spatial exercises and compare performance with visualization and spatial components of the well established "Kit of Factor-referenced Cognitive Tests", which have no anatomy

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content. Without using any anatomical terms, the spatial anatomy tests rely on icon-like figures to assess conceptualizations of spatial adjacency and correlations of 3D and sectional anatomy. Factor-reference tests (paper folding, cube rotation) were administered to 140 freshman medical and dental students at the beginning and the end of a trunk dissection course and a multiple-choice spatial anatomy test was administered at the end of the course. Fifteen 2nd year honors anatomy students, who functioned as teaching assistants (TAs), also took the tests at the end of the course. There was a significant improvement ($p < 0.001$) in the score on Factor-reference tests as a result of the anatomy course, suggesting that anatomy training enhances general visualization and spatial reasoning skills. The TAs performed significantly better on the anatomy spatial test than the students. The correlation was poor, however, between the students' performance on the Factor-reference tests and both the spatial anatomy test and the final exam. The data suggest that conceptualizations of spatial adjacency and correlations of 3D and sectional anatomy also call for cognitive skills other than the paper folding and cube rotation exercises. However, to justify the development of computer programs for promoting cognitive skills for spatial adjacency and 2D-3D correlations, the spatial anatomy tests must be validated by acquiring a gold standard. We invite members of the AACA to provide such a gold standard by taking the tests at the Association's Hawaii meeting.

SAKAMOTO*, Hirokazu, Keiichi AKITA*, Sadao TAKAHASHI* and Tatsuo SATO. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. Anatomy of thoracic and abdominal incisions from the viewpoint of the course and branching patterns of the intercostal nerves.

In surgical operations of the thoracic and abdominal organs the muscles and their nerve supply should incur minimal damage. For that purpose precise anatomic knowledge of the course and branching of the intercostal nerves is of utmost importance. Ten halves from five adult cadavers were dissected in detail with special reference to the manner of muscle supply ; of the intercostal nerves. The typical intercostal nerve consists of the main nerve, collateral branch and lateral cutaneous branch (Davies, 1932). Here, not only the main nerve but also the two branches gave off muscular twigs. The collateral branch typically arose from the main nerve at the paravertebral portion ' and ran along the upper margin of the lower adjacent rib and ; rejoined the main nerve near the midaxillary line. The collateral branch was found in 1/3 - 2/3 of all segments examined and in particular in the 7th - 9th intercostal spaces with greater frequency. Therefore, in lateral thoracotomy the collateral branch of the corresponding intercostal space is likely sacrificed. Some muscle branches to the intercostales internus and intimus arose from the collateral branch . In the right subcostal - incision, if the 7th - 9th intercostal nerves are cut, the rectus muscle above the umbilicus is affected. The

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effects of some thoracic and abdominal incisions on the muscles supplied by the intercostal nerves are demonstrated by using actual dissections and detailed maps of the intramuscular distribution of the nerves.

SAKAMOTO, Yujiro and Yoshiro TAKANO, Second Department of Oral Anatomy, Tokyo Medical and Dental University School of Dentistry, Tokyo, Japan. Mode of masticatory muscle attachment and its relation to the mandible profile.

The mode of attachment of the individual masticatory muscles to jaw bones differs considerably. Little is known whether or not the variance of the shape of the mandible is related to the mode of muscle-bone attachment. The specimens were taken from 17 human adults (10 males, 7 females) between 30 and 101 years of age (mean 73 years). The mandibles were isolated with the whole masticatory muscles attached and then, the muscle fibers removed to reveal the tendinous elements of the muscles. This technique allowed observation of attachment sites from all directions. In the medial pterygoid muscle, the sheet-like tendon layers and muscle fibers were alternately inserted into the bone crests and grooves respectively, as previously observed in the masseter muscle. This alternate relation was more distinct in the individuals having a large postero-inferior portion of the ramus and sharp mandibular angle. This relation was less clear in the temporalis and lateral pterygoid muscles that showed fan-shaped arrangement of muscle fibers. The data indicate a new evidence that the masseter and medial pterygoid muscles have similar alternate relation of the tendon and the muscle fibers. A correlation between muscle strength and alternate fiber arrangement in these muscles is suggested.

SATO, Tatsuo, Hirokazu SAKAMOTO*, Sadaaki HEIMA*, Yoko TSUBOI*, Mary SHIBUYA* and Shumei TERADA*. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. Video demonstration of the topographic anatomy of the male pelvic plexus.

In function-preserving operations of pelvic visceral organs, precise knowledge of the topographical anatomy of the autonomic nerves is crucial. As the operational field is very limited in this region, the structural relationships are difficult to view especially during surgery. Minute dissection from the lateral aspect after removal of the hip bones enables clear demonstration of the composition and detailed branching of the pelvic plexus, as well as the relationships to the blood vessels. In addition to the composition of the pelvic plexus and its distribution to the urogenital organs, the formation of the superior hypogastric plexus is shown, after removal of the inferior vena cava. The communication of the superior hypogastric plexus, hypogastric nerves and pelvic plexuses with the inferior mesenteric plexus are viewed. Critical specific nerves, such as the cavernous nerve, are traced. These plexuses and branches are examined from the

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operational view. These observations may form the basis for the development of novel function-preserving surgical techniques.

SELVARATNAM*, Lakshmi, Harshad NAVSARIA*, Alan T. CRUCHLEY*, Irene M. LEIGH* and David M. WILLIAMS*. Department of Anatomy, University of Malaya, Kuala Lumpur, Malaysia and Depts. of Oral Pathology and Expt. Dermatology, St. Bartholomew's and The Royal London School of Medicine and Dentistry, London, U.K. (sponsored by K. SUBRAMANIAM). Modulation of specific stromal factors induces aberrant cornification in adult mucosal epithelium.

Although epithelial-mesenchymal interactions are fundamental in regulating epithelial differentiation during embryogenesis, it is not clear whether adult epithelial phenotype is dependent on such extrinsic connective tissue influences. Keratinocytes (BKs), were harvested from adult human buccal mucosa (n=5 donors) and cultured for 15 days (in triplicate; 0.5-1x10⁶ cells/ml) on various stromal substrates [inert type I collagen; reticular surface of dead de-epidermised dermis (DDED); basement membrane surface of DDED or co-cultured with buccal or dermal fibroblasts]. Subsequent culture differentiation was analysed ultrastructurally and by immunolocalisation of keratin cytoskeletal proteins and other key proteins. All BK cultures stratified into multilayered, terminally differentiating epithelia (expressing involucrin) and, except on inert collagen and reticular DDED, showed good cellular organisation. Diffuse tonofilament networks and desmosomes were widely demonstrated and enhanced on basement membrane and with buccal fibroblasts. Compared to intact buccal mucosa controls, all cultures exhibited increased expression of keratin 19 (K19; 'flexible' keratin) and *de novo* expression of other simple epithelial keratins (K7/K18). Expression of mucosal keratins (K13) was independent of basement membrane although keratinocyte attachment and stratification were substantially improved in its presence. Finally, co-culturing with dermal fibroblasts induced BKs atypically to express K10 and filaggrin and produce keratohyalin granules. Thus, BKs maintain their non-cornifying/mucosal phenotype in the presence of increasingly complex non-viable stromal elements or homologous fibroblasts, but switch to an alternate pathway of cornification with the introduction of heterologous fibroblasts. These findings may help elucidate the biological mechanisms underlying pathological cornification in mucosal dysplasia /malignancy. (Supported in part by Unilever Research, U.K.)

SHIMA*, Harunobu, Michael VON LÜDINGHAUSEN¹, Kohsuke OHNO* and Ken-ichi MICHI*. First Department of Oral and Maxillofacial Surgery; School of Dentistry, Showa University, Tokyo, Japan. ¹Department of Anatomy, University of Würzburg Würzburg, Germany. The anatomical basis of microvascular anastomosis in the neck

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Morphological and morphometric investigations vessels of the neck region were carried out on 30 cadavers, (15 male and 15 female in the age range 45-93), in order to gain more knowledge of anatomy for microvascular surgery. Our results briefly. 1. The non-common-trunk type of the external carotid artery (in which each branch arises separately from the external carotid artery) was found in 76.6%. 2. In the 46.6% the facial lingual and superior thyroid veins join together and formed a thyrolinguofacialis vein. 3. The smallest internal diameter (the average was 1.2 mm) was found in the superficial cervical artery. 4. The largest diameter (4.3 mm) was measured in the external carotid artery. 5. The superior thyroid vein exhibited the smallest internal diameter (average of 2.1 mm). 6. The largest diameter (7.9 mm) was measured in the internal jugular vein. 7. The frequency and location of valves in the facie vein were also determined.

SHIMIZU Toshiyuki, Dean R. FISHER, Stephen W. CARMICHAEL, Uldis BITE*, Kohsuke OHNO*, Ken-ichi MICHI*. Division of Plastic Surgery and the Department of Anatomy, Mayo Clinic/Foundation, Rochester, Minnesota, USA. First Department of Oral and Maxillofacial Surgery, Showa University, Dental Hospital, Tokyo. The clinicoanatomical comparison of septocutaneous flap in the thigh region.

Various free flaps have been utilized in the thigh region, however, there are few systematic clinicoanatomical studies in the thigh region. The purpose of this study is to clarify the clinicoanatomical characteristics of the free septocutaneous thigh flap. Forty-two dissections were carried out in unenballed cadavers. The pedicle was observed in all cases in the anterolateral thigh (ALT), medial thigh, gluteal thigh and lateral thigh flaps. The pedicle was observed in 46% in the anteromedial thigh flap. The pedicle was observed in 86% in the posterior thigh flap. The pedicle length (153 ± 23 mm) of the ALT flap was the longest pedicle in the thigh flaps. The internal diameter of the pedicle of ALT flap (3.0 ± 1.0 mm), which could be used for anastomosis, is the largest in the septocutaneous thigh flaps. The clinicoanatomical characteristic of thigh flaps is clarified.

SHIMOKAWA, Tatchashi*, Keiichi AKITA*, Kunimichi SOMA* and Tatsuo SATO. First Department of Orthodontics, Department of Anatomy, Tokyo Medical and Dental University, Tokyo, Japan. An anatomical study of the relationships between the lateral pterygoid and temporalis muscles with special reference to their innervation.

The lateral pterygoid muscle plays a key role in the function of the temporomandibular joint. Although many anatomical studies have been conducted on this muscle, few reports have included the minute innervation findings of the lateral pterygoid. We dissected seven head halves from four

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cadavers to examine the innervation and relationships between the lateral pterygoid muscle and the nerves originating from the mandibular nerve. It is generally considered that the buccal nerve into the superior and inferior heads divides this muscle in man. However, in one case we found the buccal nerve ran between the lateral pterygoid and the temporalis muscle. According to our findings, the greater part of the lateral pterygoid muscle was innervated by branches from the anterior deep temporal nerve and frequently by branches from the middle deep temporal nerve; we consider that the lateral pterygoid muscle has a very close relationship to the anterior and middle parts of the temporalis. Based on our findings, we compiled a scheme which clarifies the relationships among the lateral pterygoid and temporal muscles and the branches from the mandibular nerve.

SINGH¹, Gurdev D., James A. McNAMARA JR.* and Scott LOZANOFF².

¹Department of Dental Surgery, University of Dundee, Scotland, UK,

*Department of Orthodontics, University of Michigan, Ann Arbor, USA and

²Department of Anatomy, University of Hawai'i at Mānoa, Honolulu, Hawaii,

USA. Deformations of the midfacial complex in Subjects with Class III

Malocclusions: Thin-plate Spline Analysis

This study determines deformations of the midface associated with Class III malocclusions. 133 lateral cephalographs of European-American children with Class III malocclusions or a Class I occlusion were compared. Cephalographs were traced, checked and 7 landmarks digitized. Data sets were scaled to an equivalent size using Procrustes analyses that indicated: significant differences ($p < 0.05$) between the average Class I and Class III morphologies; and at most but not all age groups tested. Thin-plate spline analysis indicated that non-affine transformations contribute towards the total spline. Partial Warp 3 had the highest magnitude, demonstrating compression in the antero-posterior plane affecting posterior nasal spine and mid-palatal point. This pattern was also found at ages 5, 8, 9, 10 and 11 but not at ages 6 and 7 years. Partial Warp 1 indicated localized shape changes of the maxillary alveolus whereas Partial Warp 4 produced vertical stretch anteriorly. These deformations may represent developmental diminution antero-posteriorly that, allied with vertical midfacial elongation, results in Class III malocclusions. (Sponsored by Wellcome Trust, UK and Medical Research Council, Canada).

SINGH*, Gurmit and Yee-Kong, NG*. Department of Anatomy, Faculty of Medicine, National University of Singapore, Kent Ridge, Singapore (sponsored by S. MARKS). Presence of peptidergic nerves in various male reproductive organs in the rat.

ABSTRACT

The introduction of immunohistochemical methodology has shed a great deal of light on peptidergic nerves particularly those supplying the male reproductive system. In our study, we attempted to cover as much as possible the nerves supply of the male genital tract in the rat - including the testis, seminal vesicles, prostate gland, coagulating gland, preputial gland and penis. The occurrence and ramifications of the nerves immunoreactive to the neuropeptides - namely neuropeptide Y (NPY), substance P (SP), tyrosine hydroxylase (TH), vasoactive intestinal polypeptide (VIP) were studied. Under general anaesthesia, 8 Wistar rats were perfused with 4% paraformaldehyde and after dissection, the various organs mentioned above were removed and post-fixed in the perfusate for 3-4 hrs and then kept overnight in sucrose-phosphate buffer. They were blocked and cryosectioned to 40 μ m and then processed for immunohistochemistry against NPY, SP, TH and VIP. Our findings showed that besides the testis, all the other organs showed immunoreactivity to at least 2 neuropeptides used - with, in particular, a high degree of reactivity shown by the prostate and seminal vesicles. We believe that this is the first time that dual innervation of all the major reproductive organs has been shown.

STEPHENS, Robert E. and Karen HASS WENDEL, Department of Anatomy, University of Health Sciences College of Osteopathic Medicine, Kansas City, Missouri, USA. The neoclassical anatomy lab

The heart of any clinical anatomy program lies in the anatomy dissection laboratory. In the Conte Anatomy Laboratory at the University of Health Sciences, we have taken a new approach to teaching gross dissection to first year medical students. The lab design and audiovisual technology have significantly increased student participation, interest and student-teacher interaction. The lab design is reminiscent of the way anatomy was classically taught. Fifteen 27" SVHS, ceiling-mounted monitors, arranged in a semicircular fashion, direct the students' focus toward the central dissection area and allow them to dissect with the instructor. Students can view the general dissection orientation and the instructors as they dissect while still being able to get a close look at the dissection as it is being done. In the central dissection area, two 40" television monitors and a three chip, ceiling mounted Sky Eye camera capture a dissection area as small as two square inches. A stereoscopic Zeiss microscope with a similar camera is used to dissect detailed structures. Rhinoscopy, laryngoscopy, bronchoscopy and laparoscopy are also used in the lab via corresponding video cameras. Histologic and pathologic sections are available using the laserdisc player or resident computer. Both may be displayed on all monitors. The lab has complete SVHS video production capabilities and can send real time images to the video projector and theater screen in the lecture auditorium. This neoclassical approach to teaching anatomical dissection has been an effective and efficient method of

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learning. It prepares students for the clinical environment and enhances the CME clinical anatomy courses.

SUBRAMANIAM, Krishnan, Phrabhakaran NAMBIAR* and Murali D.K. NAIDU. Departments of Anatomy and Oral Biology, University of Malaya, Kuala Lumpur, Malaysia. The frontal sinus: A unique anatomical landmark for forensic identification

The uniqueness of anatomical structures and their variations are very useful in forensic identification of unknown deceased persons. Similar to fingerprints, the variability of the frontal sinuses is so great that the chances of two individuals having the same morphology of the frontal sinuses are extremely remote. Extraoral radiographs provide an excellent record of these sinuses. Our retrospective study also confirmed a multitude of combinations in relation to size, bilateral asymmetry, outline of superior borders (including loculations), the presence of partial septae as well as complete cells. We further wish to report a case where this knowledge was used for forensic identification. An unfortunate Caucasoid victim of a commercial airline crash in an advanced state of decomposition could not be identified using conventional forensic criteria. Due to the absence of dental records, the victim's family sought out all available medical records, which included a radiograph of the occipitomental view of the skull. Post-mortem radiographs were taken at different angulations because of difficulties in head positioning. These were matched with the ante-mortem radiograph using tracings and superimpositions. Morphology of the frontal sinus matched exactly and the victim was identified. In conclusion the frontal sinus can serve as a forensic "fingerprint" for identification.

SUBRAMANIAM, Krishnan, James P. TRAVERS*, Murali D.K. NAIDU, Lakshmi SELVARATNAM*, John P. JUDSON* and A.M. HASSAN*. Department of Anatomy, University of Malaya, Kuala Lumpur, Malaysia. Mammalian whole embryo culture: A powerful research tool for the study of teratogenesis.

Since organogenesis begins immediately after implantation of mammalian embryos, *in situ* observations are not possible. The alternative is to study whole embryos in culture. Embryos were explanted from the uterus of pregnant rats before organ development (day 9[~]). Each embryo (and its membranes) was dissected out from the decidual mass (egg cylinder stage) and immediately transferred to a culture bottle containing heat-inactivated homologous and autologous rat sera as the nutrient medium. The embryo-containing culture bottles were wrapped in blood warmer jackets connected to a circulating water bath maintained at 37° C; this ensemble was placed on a horizontally rotating deck (80 r.p.m). The culture bottles were gassed (O₂, N₂ and CO₂) daily according to established protocol and the incubation medium was changed daily. Using this procedure, we have managed to successfully grow rat embryos *in vitro* for 5 days until the fetal stage, with limb and tail development. Since this culture method

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supports embryos particularly well throughout organ formation, it is a powerful tool in the study of teratogenesis. Drugs and test substances can be added to the culture medium or injected into precisely located sites in the embryo and continuous observation can be made on its effects on the embryo. (Supported by Grant No. F 276/96 from the University of Malaya, Kuala Lumpur, Malaysia.)

SYED ALI, S., Department of Anatomy and Cell Biology, Justus-Liebig University, Giessen, Germany. (sponsored by D.O. Graney) Comparative angioarchitecture of the islets of Langerhans in vertebrates.

A systematic study of the islets vasculature from teleosts up to the mammals was performed by us with corrosion-cast. In teleosts, the Brockman body, the homolog of the Langerhans islets, is supplied by a twisted artery, which enters the capsule in a corkscrew manner and divides into fine capillaries. These capillaries ultimately open into sinusoids and drain back to the efferent vessels. In amphibians, there is a relatively simple structure of the blood supply system. The islets of Langerhans are small and scattered over the whole pancreas and form a meshwork of capillaries, belonging to the exocrine portion of the pancreas. The islet capillaries are arranged like a ring and out of this ring the further connections radiate to the efferent part of the blood circulation. As far as studied, in reptiles the blood circulation of the islets of Langerhans is represented by arterioles, ending in capillary meshwork like a serpentine. These capillaries drain back the blood into the interlobular venules of the pancreas. A few of these capillaries course through the halo-like zone of the islets of Langerhans as interconnecting capillaries. In the pigeon the blood circulation of the islets is a simple arterio-venous anastomosis, whereas in the domestic chicken the widened capillaries in the meshwork resemble „sausages“ and are termed by us as haustra-like structures. In mammals the lobular artery divides dichotomously, giving branches to the exocrine portion and to the islets. The islets and the exocrine portions are supplied separately. The entering artery widens at the junctional zone between the endocrine and exocrine pancreas, making up the so-called swollen structures. These are known to be post capillary sphincters and are equipped with pericytes at both ends, separated by a basal membrane. The halo-zone contains a few interconnecting capillaries. To understand the three-dimensional structure of the cyto- and angioarchitecture, the observations were carried out from the corrosion-cast preparations with scanning electron microscopy.

TAKAHASHI*, Sadao, Keiichi AKITA* and Tatsuo SATO. Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. The spatial arrangement of the branches of the pancreatic duct in the head of the pancreas.

ABSTRACTS

It remains very difficult to comprehend the spatial arrangement of the branches of the pancreatic duct, especially in the pancreas head, despite the recent progress in imaging diagnosis techniques, such as endoscopic retrograde pancreatography. We minutely dissected the pancreas head regions from ten cadavers after injection of resin or silicon into branches of the pancreatic duct via the papilla of Vater in order to investigate the distribution of the branches of the pancreatic duct. In the uncinate process, which is the region dorsal to the superior mesenteric artery and vein, the parenchyma was difficult to divide into two parts; the ventral pancreas originates from the ventral pancreatic bud and the dorsal pancreas from the dorsal pancreatic bud. The uncinate process contained branches from both Wirsung's duct and Santorini's duct. Based on these findings, we compiled a scheme of the spatial arrangement of the branches of the pancreatic duct in the pancreas head.

TAN*, Yi, Gurmit SINGH*, B-H BAY*, and C-M FONG*, Department of Anatomy, National University of Singapore and Department of Pathology, Singapore General Hospital (sponsored by S. MARKS).

Light microscopy and image cytometry of large cell lymphoma

There has been an increase in incidence in the number of patients with non-Hodgkin's lymphoma (NHL) with an estimated 50,000 new cases in 1996. Prognostic factors employed to determine the aggressiveness of such tumors have included tumor stage, lactate dehydrogenase levels, *p53* tumor suppressor gene mutation, elevated interleukin-6 levels and *bcl 2* oncogene expression. The purpose of this study is to explore the use of image cytometry for prognostication. A lymph node specimen from a patient with large cell lymphoma is stained with haematoxylin and eosin and examined under a light microscope linked to a Carl Zeiss KS 400 image analyser. The nuclear profile area, perimeter and roundness were determined. The number of mitoses and apoptotic cells per 10 high power fields were counted. Histopathological analysis revealed complete effacement of architecture by a diffuse infiltrate of large lymphoid cells with vesicular nuclei. Nuclei were pleomorphic and classified as Grade 3. The number of mitoses exceeded apoptotic cells signifying a growing tumor. Large cell lymphoma is known to be a high grade malignant NHL and appears to be associated with a high nuclear grade and a positive difference between the mitotic and apoptotic index. Nuclear grade, mitotic and apoptotic indices may therefore be useful morphometric predictors of survival for NHL.

TSUBOI*, Yoko, Sadaaki HEIMA*, Hirokazu SAKAMOTO*, Mary SHIBUYA*, Shumei TERADA* and Tatsuo SATO.* Department of Anatomy, School of Medicine, Tokyo Medical and Dental University, Tokyo, Japan. Video demonstration of a detailed dissection of the abdominal paraaortic lymphatics.

ABSTRACT

Lymphatics below the diaphragm finally converge at the abdominal paraaortic lymph node chain before entering the thoracic duct. Therefore, precise knowledge of this chain is of utmost importance for surgery of cancer of the abdominal and pelvic visceral organs. However, students and surgeons actually have little chance to observe this structure which is very complicated and difficult to dissect. We performed a minute dissection of this lymphatic chain in an adult male cadaver with reference to the relationship to the surrounding structures and recorded a video of the findings. The main focus is on the following items: (1) arrangement of the lymph nodes in the vicinity of the abdominal aorta and inferior vena cava, (2) relationship of the lymphatics to the nerve plexuses, (3) topographic importance of the left renal vein as the convergence point of the formation of the lumbar trunks, (4) drainage of lymphatics from the pancreas and hepatic pedicle into the paraaortic chain, (5) tracing of lymphatics along the common iliac nodes to the paraaortic chain and (6) importance of the interaorticocaval nodes immediately above and below the left renal vein for abdominal cancer operations.

TUCK*, Nathaniel R. JR., Michael L. KIELY, Adam L. WILDING*, Gregory D. CRAMER, Joel WEISBERG*, Shari R. WEBSTER* and Shahar KENIN*. National College of Chiropractic, Department of Anatomy, Lombard, Illinois. USA
Quantification of the superior head of the lateral pterygoid muscle attachment to the temporomandibular joint complex.

The specific morphologic relationships of the components of the temporomandibular joints (TMJs) are still controversial. The TMJs from 19 cadaver specimens were carefully dissected so that the attachment relationships of the superior head of the lateral pterygoid (SLP) muscle to the disc/capsular complex of the TMJ were clearly demonstrated. The SLP attached to the anteromedial portion of the disc/capsule interface. Each of these dissections was photographed from a standardized superior view. Using a digitizing morphometric procedure, the following measurements were taken from each photograph: 1) The anterosuperior margin of the articular disc from its medial to lateral-most extent and 2) the length of this margin providing attachment for the SLP. Three observers used a Calcomp 9500 digitizer and an average value was determined for each measurement. A reliability study showed high inter and intra-observer agreement. The mean percent value for SLP attachment was 34.73% with a range of 21.50% to 52.38%. Distinctions were drawn between the data from normal specimens and those showing disc pathology, e.g. perforation ($P > 0.06$). These pathologic specimens ($n = 5$) showed a mean attachment of 24.38% with a range of 11.27% to 35.57%. These results showing a range in the length of SLP attachment at the disc-capsule interface in normal and pathologic specimens may provide a basis for further studies on dysfunction in the TMJ.

ABSTRACTS

VU, Dzung and Helene HOFFMAN*, School of Anatomy, University of New South Wales, Sydney, Australia. School of Medicine, University of California, San Diego, USA. "Anatomic VisualizeR®": a Virtual Reality (VR)-based learning application.

We are developing "Anatomic VisualizeR®", a VRbased curricular application for students of clinical anatomy. The 3D anatomic models which form the nucleus of the program (reconstructed from the Visible Human™ dataset) and the supporting 2D media (text, images, video, etc.) can be freely manipulated and learning by discovery is encouraged. "Guided lessons" provide core content, suggest activities to enhance visualization and include links to clinically relevant issues and ancillary learning opportunities. These lessons are non-sequential and can be interrupted at any time, encouraging users to freely explore the environment. Discussion: VR is emerging as a powerful and compelling foundation for the development of next-generation learning environments. As a tool for learning the complex spatial domain of anatomy, it has many advantages. Not only does it provide virtual 3D objects that learners can explore from various points of view, it goes beyond the real world by allowing learners to interact with or alter these virtual objects in ways that are difficult or impossible on actual objects. It can also provide multisensorial, contextual and experiential environments that facilitate meaningful and useful learning by encouraging learners to incorporate newly acquired knowledge into an integrated framework. (Supported by Grant No. DAMD 17-94-J-4487/P5002 from the Defense Advanced Research Projects Agency)

WATANABE, H.1,2,C.A.MACKAY1,E.H.RISLAUSKISI*/A.MASONSAVAS1, T.YANAGISAWA2* and S.C.MARKS, JR.1 1 Department of Cell Biology, University of Massachusetts Medical School, Worcester, Massachusetts, 2Department of Ultrastructural Science, Tokyo Dental College, Chiba, Japan, The cytoskeleton, cell attachment and survival of osteoblasts in osteopetrotic(tl) rats.

In the tl rat mutation osteoblasts(OB) are absent from older bone surfaces and they have been implicated in the restricted osteoclast development and function characteristic of this mutation. We studied the cytoskeleton of tl OB in vivo and in vitro to explore the potential relationships between these structures and cell survival. Electron microscopy of triton-perfused rats showed stress fibers(SF) inserting into adhesion plaques as prominent features of the cytoplasm near bone surfaces in normal OB. Only half of the OB in tl rats had SF and these were either significantly shorter or abnormally distributed in the cytoplasm. One-fifth of tl OB showed ultrastructural features of apoptosis. In 900 young normal OB in vitro mRNA for beta and Gamastan showed characteristic, different distributions by in situ hybridization. Mutant OB showed a significantly reduced capacity to localize these mRNA and many OB had no label. These data show that the

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reduced lifespan of OB in tl rats is correlated with a reduced ability to form SF and to localize mRNA related to cell structure and attachment. It is our hypothesis that the primary genetic lesion which leads to the tl phenotype interrupts a signal transduction pathway which is critical for the proper sorting of actin mRNA and the localized synthesis and assembly of actin, which in turn inhibits normal actin function and ultimately results in apoptosis. Similar abnormalities many contribute to altered skeletal metabolism in osteopetrotic children.

WEIGLEIN, Andreas H. and Heinz SCHMIDBERGER*, Anatomical Institute and Department of Radiology*, Karl-Franzens-University Graz, Austria, Europe. Radiologic anatomy of the atlas - Diagnosis of Jefferson fractures.

The first cervical vertebra - the atlas - differs from all the other vertebrae in lacking a body. The body of the atlas has become the dens of the axis and thus allows rotation of the head. The dens is retained to the anterior arch of the atlas by the transverse ligament of the atlas. This ligament is attached to both lateral masses of the atlas at a bony bump, which we want to call „colliculus atlantis“. Behind this colliculus there is a small pouch, which we want to call the „foveola atlantis“. In the deepest part of this foveola an artery enters the atlas. This artery is the nutrient artery of the atlas. Both the colliculus and the foveola can easily be seen in open-mouth view radiographs as well as in axial CT-scans. Jefferson fracture is a burst fracture of the atlas caused by axial force impact. As the atlas is a ring it must break at least two times whenever it breaks. Moreover, the transverse ligament of the atlas must rupture during this injury, too. Due to the strength of this ligament the attachment of the ligament breaks and thus the colliculus atlantis is dislocated. So there is an accompanying avulsion fracture of the colliculus atlantis with every burst fracture of the atlas. Jefferson fractures are often unrecognized or diagnosis is delayed because of diagnostic difficulties, sometimes they are mistaken with anterior or posterior atlas clefts. Difficulties in diagnosis are due to the fact that a lateral displacement of the lateral masses does not occur in all Jefferson fractures. However, the avulsion fracture of the colliculus atlantis is pathognomonic for Jefferson fractures. In conclusion, Jefferson fractures should no longer be a diagnostic problem for radiologists.

WELLS*¹, James P., Jean E. TURNQUIST*². ¹West Virginia School of Osteopathic Medicine, Division of Structural Biology, Lewisburg, West Virginia and ²University of Puerto Rico, Department of Anatomy, San Juan, Puerto Rico (sponsored by James W. Nemitz). The development of the propulsive hind limb in human and non-human primates: A comparative model.

Comparisons of early ontogenetic changes in the limbs of rhesus macaques and humans show that the relative masses of each limb segment and their relative increases in mass during early infancy are very similar in the two species. In both

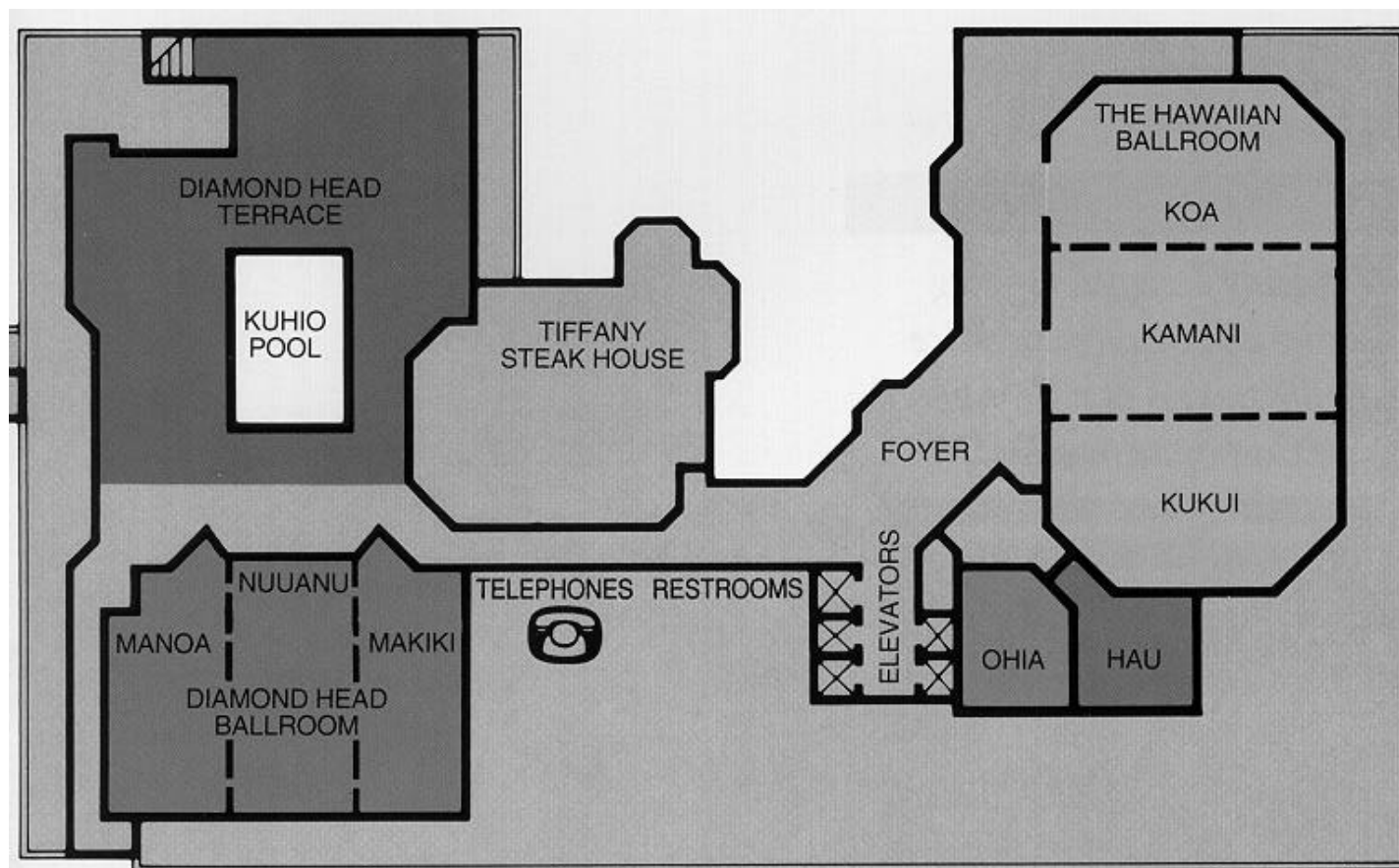
ABSTRACT

species, during the quadrupedal stage, a balance of the fore and hind limb, in terms of segment weights and lengths is replaced by a clear dominance of the hind limb which becomes the propulsive element while the forelimb is used in steering. In both species, the locations of the centers of mass of the proximal two segments in each limb are similar and differ from that of the most distal segment as both develop an efficient form of locomotion. Segment lengths, weights, center of mass, locations and radius of gyration were collected from rhesus cadavers with known ages at the Caribbean Primate Research Center. Actual locations and ontogenetic shifts in the center of mass differ slightly between species. This is not surprising since during early development, young rhesus monkeys develop a quadrupedal gait with predominate hind limb propulsion while human infants first develop a quadrupedal gait (crawl) followed by pedalism. Young macaques, like human infants, keep their center of mass low to the substrate upon which they are posturing and locomoting. In addition, both primate species attempt to broaden their base of support by limb abduction. Keeping the center of mass low and broadening the base of support represents an effort by the developing primates to achieve maximum stability. A current study of human infants surveys biomechanical segment parameters and focuses on development of the propulsive hind limb dominant form of locomotion, quadrupedalism leading to bipedalism. (Sponsored by grants from the American Osteopathic Association and West Virginia School of Osteopathic Medicine).

Hawaiian Regent Hotel

Kuhio Tower

Third Floor



All platform and poster sessions will be held in the Hawaiian Ballroom and Diamond Head Ballroom, respectively, located on the third floor of the Kuhio Tower.

The Tuesday evening Welcome Reception will be held in the Ocean Terrace on the third floor of the Kalakaua Tower

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