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Greetings HAPSters!

I am excited and humbled to begin my year as president, especially when I look over the list of those who preceded me. Those are some shoes to fill. But I also have their shoulders to stand on, and I look forward to working with the board, our committees, and our membership to continue HAPS’s growth and development.

I’d like to start by thanking several board members for their service. Caryl Tickner has completed a terrific term as President, a year that included a number of challenges but also provided us with new opportunities. Thanks, Caryl, for your patience with me over the past year, and thanks in advance for your counsel over the coming year. John Waters has completed his term as Past President and, after three years of service, has officially become a President Emeritus. Just as quickly, he has agreed to co-chair the HAPS-Institute Committee and in that role has already begun exploring some exciting new possibilities. John’s love for HAPS is an inspiration. Thanks, John, for all you have and will continue to do for us. Wanda Hargroder has completed her term as Secretary, and Craig Clifford has completed his as Southern Regional Director. Both Wanda and Craig are devoted HAPS members who have provided insight, wisdom, and direction to our Board of Directors. Thank you, Wanda and Craig, for all you’ve done for us.

I’d also like to welcome three new members to the Board of Directors. Dee Silverthorn begins her three-year term of service this year, and brings us the benefit of her experience, her standing in the academic community, and her connections with other professional organizations. Lucia Tranel has begun her term as Secretary. Lucia is a long-time active HAPS member and we welcome her to the board. Jason LaPres has begun a two-year term as Southern Regional Director. Jason is an active listserv and participant in HAPS workshops and conferences. Welcome, Dee, Lucia, and Jason! We look forward to working with you.

The Board of Directors will be working on a number of initiatives this year. We will continue to work on the initiatives identified in our Strategic Plan, including review of our governance structure and expansion of our professional outreach through our relationships with other professional organizations, and expansion of HAPS-Institute offerings. In addition, we’ll be working on revisions and improvements to the HAPS website and on a review of services we offer to our membership. If you have suggestions, comments, or criticisms on any of these, please let us know. We are keenly interested in suggestions that will help our membership continue to grow and in suggestions on how we may better communicate with and for our members. As membership grows, so does the impact of all that we do -- whether it’s our work on curriculum development, the HAPS Comprehensive Exam, or our efforts with accrediting bodies. Our focus on improving the quality of instruction in anatomy and physiology is an important one as public and private institutions look to minimize costs while maintaining quality.

It is also not too early for you to begin planning for what’s shaping up to be a terrific annual meeting in Tulsa. I know I’m not the only HAPSter who hasn’t been to this area, and I’m looking forward to seeing the country, the museums, and my fellow HAPSters. More information on the conference will be coming out over the next several months. Look for it and plan on joining us in May 2012.

We’ve received a number of inquiries from institutions interested in holding regional conferences. I think it would be terrific if my year as President were remembered as the year we planned or held regional conferences in all four of our regions. Please contact us if you are interested.

I’m looking forward to the challenges of the year ahead. Thanks to all who make HAPS such a great organization, but especially to our committee members and chairs, who contribute so much. I’ll be in touch as frequently as I can over the next year and wish you all a successful start to the fall semester. Thanks for your membership and support!

Don Kelly
President, Human Anatomy and Physiology Society
Welcome, guest!

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FROM THE EXECUTIVE DIRECTOR

I hope you are having a great semester. Remember the support that HAPS can provide to you in your efforts. We have curriculum guidelines available, testing services, position papers, safety guidelines, and, of course, the publication you are reading right now has a wealth of information that may help you achieve excellence in teaching Human Anatomy and Physiology.

Our listserv is another great resource. Your colleagues are happy to help with teaching ideas and answers to questions you may have. As you may know, we have changed our listserv to a “members only” feature. Once at the website (hapsweb.org,) click on “Communicate,” log-in as a member and then you will be able to sign up for the listserv.

We are planning a combined Eastern/Southern Regional Conference March 2 – 3, 2012, in Jacksonville, FL. The conference is being organized by Florida State College at Jacksonville. Go to our website (hapsweb.org) for more information along with a call for presenters.

It’s also time to start making plans to attend our 26th Annual Conference in Tulsa, Oklahoma, May 26 – May 31. The conference committee, under the leadership of Karen McMahon, is doing an excellent job of planning another outstanding professional development event. The hotel facilities plus the campus of the University of Tulsa are excellent. And don’t underestimate Tulsa as a destination. The committee is planning outstanding activities and the city has a great mix of entertainment and educational opportunities.

I look forward to serving all our members in any way I can.

Remember...Learn, Discover, Share with HAPS.

Cheers,

Larry

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President’s Medal Recipient: 
Tom Lehman

By Caryl Tickner
HAPS Past President

The President’s Medal is a prestigious award that is given annually to one HAPS member who has provided exemplary service to HAPS. This year’s recipient, Tom Lehman of Coconino Community College, represents the essence of HAPS.

Tom has been a HAPS member since 2000 and became very active in HAPS right from the start. His contributions to HAPS are numerous. Tom has given well-attended workshops at annual conferences, contributes articles to HAPS-ED, and is an active participant on the listserv. He has supported the mission of HAPS by hosting a regional conference in 2003 in Fort Morgan, Colorado.

Tom has served as chair or co-chair of the various versions of HAPS’ Web Committee and has been the chair of the Steering Committee since 2004. The Board recently appointed him to another three-year term as chair of the Steering Committee because of the incredible job he does. He has unprecedented organizational skills and the unique ability to keep many strong personalities on task and on track – and always with a smile on his face!

Because of his vast knowledge of HAPS members, Tom has served on multiple nominating committees. And Tom does seem to know EVERYBODY! Thus, he has assumed the unofficial title of HAPS “Social Director and Ambassador.” Tom initiated and continues to organize the very successful HAPS Scavenger Hunt for HAPS members attending their first HAPS annual conference. This event involves first-timers seeking out committee chairs and gathering their signatures so the first-timers can be entered into a prize drawing. This simple but ingenious game allows new HAPS members to connect with each other, to engage in discussion with committee chairs, to learn about HAPS and its committees, and, ultimately, to get first-timers involved in HAPS from day one!

At every HAPS annual conference, Tom coordinates a T-shirt exchange where members can bring a T-shirt from their institution and trade it for a shirt from another institution. This provides yet another way to develop relationships with colleagues from throughout the US and Canada.

Tom loves to tie-dye and for many years, he has given individualized tie-dyed t-shirts to annual conference coordinators – a much coveted item!

Tom’s “ambassadorship” continues long after HAPS annual conferences end, as he travels thousands of miles throughout North America, spending time with HAPS members in their hometowns.

Perhaps most importantly, Tom personifies the intangibles of HAPS that those of us who have been members a long time recognize. HAPS is more than update seminars and workshops. It is also the support we give each other as colleagues both professionally and personally…. the life-long friendships we make.

I am proud to call Tom my colleague and friend, and humbly honor him with this year’s President’s Medal.

Caryl Tickner
HAPS President
2010-2011
That’s right – we’ll be living on Tulsa Time at the HAPS 26th Annual Conference in Tulsa, Oklahoma, May 26 – May 31, 2012. Mark your calendars now and plan to register early so that you get the lowest registration fee and the best rate on hotel rooms. Don’t wait until you are Twenty-four Hours from Tulsa to put it all together.

Your Board of Directors and Steering Committee held their mid-year meeting while Passing through Tulsa just a few weeks ago. All were very impressed with the hotel facilities, and had a great time doing The Tulsa Shuffle to check out Tulsa on a Saturday Night in the downtown area. Your conference coordinator, Tulsa Queen Karen McMahon, is putting the final touches on the program and is busy trying out all the cultural opportunities in the area in order to put together a terrific package for all of us. Rumor has it that with her coordinating committee she’s gone through the Tulsa Telephone Book to find every dining opportunity within walking distance of the hotel.

Tulsa is a bustling city in eastern Oklahoma. Route 66 runs right through its center. The oil industry was anchored in Tulsa for many years and still has a strong presence there. Tulsa is home to the Oklahoma Jazz Hall of Fame, the Philbrook Museum of Art, the Sherwin Miller Museum of Jewish Art, the Tulsa Air and Space Museum and Planetarium, the Oklahoma Aquarium, the Tulsa Zoo and Living Museum, and the Arkansas River Historical Museum. The Tulsa Drillers baseball team, a double A Colorado Rockies franchise, plays in a stadium within walking distance of the conference center. Tulsa ranks third behind New York and Miami in its treasury of art deco architecture; tours of the art deco buildings will be available during the conference week.

We’re sure there will be no Tear Drops in Tulsa when you join us for the conference, so whether you are Ten Miles to Tulsa, Halfway to Tulsa or must travel from Tampa to Tulsa, book your tickets now. We’re sure that after the 26th annual HAPS Conference you’ll be singing Take me Back to Tulsa, with all those good HAPSter memories of your Last Trip to Tulsa.

How many other songs have Tulsa in the Title?
The Day She Left Tulsa
Don’t Let the Sun Set On You in Tulsa
Don’t Make Me Come To Tulsa
Tell Me Something Bad about Tulsa
Tulsa Turnaround
Tulsa Sounds like Trouble to Me
Tulsa County
Tulsa Baby
Tulsa Girl
Tulsa Straight Ahead

The name “Oklahoma” comes from the Choctaw words: “okla” meaning people and “humma” meaning red, so the state’s name literally means “red people.”

The state flag features an Osage warrior’s shield on a blue background. Seven eagle feathers decorate the shield. An olive branch and a calumet, or peace pipe, lay across the shield.

The state bird is the scizzortail flycatcher; the state flower is blanketflower.
Summary of Update Seminar #2
Toward Personalized Immunotherapy of Cancer

Presented by Brad Nelson, PhD
Trev and Joyce Deely Research Center
British Columbia Cancer Agency
Victoria, BC

Summarized by Hiranya S. Roychowdhury, PhD
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Through a dynamic presentation, Dr. Nelson provided the audience with a valuable glimpse into the significant progress that has been in cancer immunotherapy.

Cancer is dealt with using a three-pronged approach: prevention, early detection, and treatment. Prevention essentially entails reducing the chance of establishment of a transformed cell mass that might lead to hyperplasia; early detection of a developing neoplasm also reduces the chance of a benign growth progressing to a malignancy. The factors that significantly reduce the probability of cancer are the avoidance of smoking, regular exercise, healthy diet (including plenty of fresh fruits and vegetables), reduction to UV exposure, and maintaining a healthy body weight.

Since deaths from lung and bronchial cancers are the highest, Dr. Nelson spent a significant amount of time talking about their etiology. He also pointed out that while the mortality due to lung cancer has been declining among men in the USA since the early 1990’s, the trend has reversed among women. This trend correlated with the increase in the number of women who started smoking in the 1960’s and 70’s.

Contrary to common opinion, incidences of most cancer-related deaths have actually been decreasing steadily. Even deaths from smoking-related cancer, which still ranks the highest by several fold, have shown a decline in the US since the 1990’s. The decline in smoking related cancer obviously correlates with better lifestyle choices shown in the developed world. In Canada, the smoking rate has dropped significantly across all the demographical groups.

The audience was introduced to a relatively new coinage: “Third hand smoke.” However, instead of referring to the surface residues of tobacco smoke, Dr. Nelson poignantly used the phrase in a socio-economic context. To counter the revenue loss in the developed west, tobacco companies have targeted the rest of the world to boost sales. Consequently, Asian and African nations have seen staggering increases in social and economic costs due to tobacco-related ailments. Globally, second-hand smoke kills more than 600,000 individuals each year. There being no safe level of tobacco smoke, the only way to combat the primary cause of lung cancer would be to create “100% smoke-free” environments. While many countries have enacted laws addressing this fundamental aspect, and while it has been more than a decade since the WHO had published a framework on tobacco control (“World Health Organization,” 2003), more than 94% of the world’s population have no such protection yet. A substantial amount of the profit from every package of cigarettes goes to facilitate the sale of more cigarettes globally.

The next big challenge in prevention of cancer is weight control by individuals. It was quite a revelation to most in the audience to learn that obesity in most states had doubled between 1992 and 2000 -- a rather short span of eight years. This is something that is easily reversed with advocacy of lifestyle changes, viz. healthy food and regular exercise, among individuals of all age groups.

If prevention fails, the next best thing in terms of cure is to be able to detect any neoplastic changes early. In this context, Dr. Nelson presented data for the survival rate among ovarian cancer patients through early detection (Fig. 1). Post metastasis, successful treatment of any type of cancer is quite unlikely. Thus, detection in situ, and early, would mean that that the neoplasm could be treated locally and with less invasive procedures.

The routine detection methods, depending on the type of cancer are: mammography (breast), visual or manual inspections (skin, breast, colorectal), histology (cervix, lungs) and biomarkers (prostate, thyroid, etc.). Despite advances in the use of bio-molecular tools, the direct detection is often limited by the logistics of trying to find a tumor that is often 1mm or less in a tissue section, especially in the absence of a targeted biopsy.

Scientists at the Canary Center at Stanford are engaged in identifying biomarkers for early detection

(Continued on next page)
of ovarian, pancreatic, prostate, and lung cancers. These biomarkers can be used for early detection through blood tests and additionally, in conjunction with nanoprobes, through imaging techniques. The supplementary advantage may be the targeted destruction of pre-cancerous tissues and/or cells using nanoprobes.

Once cancer is established, the final options are treatment using surgery, radiation therapy, hormone therapy, chemotherapy, or antibody-mediated therapy. Radiation therapy works with some success for highly radiosensitive to moderately radiosensitive cancers that are in their early stages. Cancer treatment with older radiation therapy methodology often had significant toxicity to off-target surrounding tissues. As an example, Dr. Nelson presented images of radiotherapy on a breast cancer where the two-dimensional radiation affects the lung ipsilaterally and portions of the cardiac tissue as well. On the other hand, the modern technique of Intensity-modulated Radiation Therapy (IMRT), where multiple beams at different angles are modulated to match the volume and contour of the organ with improved precision, delivers treatment to the tumor as well as the mammary lymph nodes with a significantly smaller “footprint,” sparing adjacent and surrounding organs (Fig. 2). The improvement in early detection and the subsequent treatments of breast cancer have definitely improved over the past forty years. The data from British Columbia (which are representative of the Western world) show a steady and significant increase in the survival rate between those diagnosed in 1975 and those diagnosed in 2000. However, the audience was cautioned against extrapolating further on an individual basis since, as in any cancer, the type of malignancy is a significant factor in determining the outcome.

Progress in the cancer treatment and management has come at a high price. In British Columbia, the budget for oncology drugs showed a 650% increase over a ten year period ending in 2009. It was pointed out that the country’s health care budget would not be able to sustain the level of spending at that rate. A quarter of the increased was towards traditional chemotherapy drugs that rely somewhat on a “shotgun approach,” while the rest was spent on modern “wonder drugs” that often cost approximately $50K per patient for each round of treatment.

Personalization of cancer therapy takes advantage of the transformed nature of the neoplasm for targeted drug delivery. The genome level errors that arise through point mutations as well as extensive chromosomal aberrations (structural as well as at the ploidy level) make the cancer cells “foreign” to the body, thereby offering the possibility that a therapeutic agent may be developed to distinguish the “foreign” from the “native.” With the improvement in molecular tools at our disposal, such a personalized approach, utilizing immunological tools, may indeed reduce the cost of cancer treatment.

Were it not for the body’s immune system, the incidences of cancer would be several-fold higher in a population. The native tissue is left alone by the body’s own defense mechanism because the circulating T cells “learn” to recognize the cell surface proteins (presented by the MHC-I) as “self.” The cytotoxic CD8+ T lymphocytes and the Natural Killer (NK) cells are responsible for recognizing the cytosolic peptide fragments that are presented by the MHC-I of all nucleated cells. Thus, transformed cells with “unrecognizable” peptides presented to the MHC-I would normally be destroyed by the cytotoxic T lymphocytes (CTL). Cytolytic compounds (perforin, granzyme, etc.), secreted by the CTLs, induce apoptosis in target cells and are the primary players in the anti-cancer role of the immune system. As cancer cells often infiltrate nearby lymph nodes (e.g. the axillary sentinel node in breast cancer) tumor-infiltrating lymphocytes (TIL) from these nodes respond to the metastasis by migrating to the site of the developing tumor and destroying transformed cells selectively. The importance of this mechanism in the body’s natural ability to fight cancer is also demonstrable in ovarian
cancer (Fig. 3). Additionally, B-cell mediated response in cancer surveillance has been documented in recent years. Several immune-modulators, immunostimulants (cytokines), and monoclonal antibodies have been used in cancer therapy. In patients with hairy cell leukemia, alpha-Interferon (IFN-α) has been used with 80 – 90% success.

While cancer immunosurveillance was proposed as far back as 1957 (Burnet 1957), it is only in the last decade that the idea of a targeted approach towards cancer therapy has gained some traction. When the body’s own innate immune mechanisms fail, the adaptive immune response takes over. This key idea is utilized in targeted immunotherapy for cancer. As Dr. Nelson stressed during his presentation, any technique that enhances and utilizes the body’s natural defense mechanism would be a step in the right direction. Thus, an effective physiological response via the body’s immune system ought to address both the innate and the adaptive responses.

The attenuated form of mycobacterium (Bacillus Calmette-Guérin; BCG) has been effective in treating early stage bladder cancer since the 1980’s (reviewed in Alexandroff 1999). The instillation of mycobacterium causes localized inflammation and induces the innate immune response, leading to the sloughing of the epithelial lining along with the tumor cells. This was perhaps the first instance of “cancer immunotherapy.”

Monoclonal antibodies, because of their unique specificities, are of special interest. Rituximab (Rituxan™) binds to the CD20 of B-cells, and hence is used to treat B cell lymphomas. Besides inducing apoptosis in the CD20+ cells, it has been shown to cause antibody-mediated and complement-dependant cellular cytotoxicity (Shaw et al. 2003). Cetuximab (Erbitux™) is another monoclonal antibody that appears to work in part through complement activation. It is used in patients with metastasized colorectal cancer and squamous cell carcinoma of the head and neck. Antibody-mediated complement activation against neoplasia is a powerful mechanism and the interplay between the T-cells and B-cells in cancer immunotherapy is of a significant interest in Dr. Nelson’s lab.

Since Interleukin-2 (IL-2) is responsible for T-cell development, it is used to potentiate immunological surveillance against certain types of cancers, namely, malignant melanoma and renal cell carcinoma. However, it has some serious side effects due to its lack of selectivity in “ramping up” of the immune system. Pulmonary edema due to systemic capillary leak syndrome, as well as shock and seizures, for example, are among the side effects that ultimately limit its widespread use.

Alpha-interferon (IFN-α), the polypeptide ubiquitous in infected or transformed cells, is in use to treat a variety of cancers because of its antiproliferative, anti-angiogenic, and immunomodulatory properties. Furthermore, the IFN-α induced increase in MHC-I expression by the tumor cells also facilitates successful surveillance by the T-cells.

The CTL- Antigen 4 (CTLA-4 or CD152) is another important immunomodulatory protein that is known to be under negative feedback mechanism playing a regulatory role in T-cell proliferation. Ipilimumab (Yervoy™), a human monoclonal antibody designed to block CTLA-4, and hence maintain higher than normal T-cell activation, was approved recently by the U.S. Food and Drug Administration (USFDA) for late stage melanoma (Hodi et al. 2010, U.S. Food and Drug Administration 2011).

Another logical avenue is the boosting of the patient’s immunity through vaccinations against specific antigens. Following are a few of the methods being used:

- Multiple tumor-specific antigens from the patient are injected back into the patient with potent adjuvants to boost specific immunity.
- Autologous antigen-pulsed dendritic cells are reinjected in the hope that there will be a strong cell-mediated immune response in the patient (protocol reviewed in Dudley and Rosenberg 2003). Sipuleucel-T (Provenge™) was the first such autologous cancer vaccine against asymptomatic, late-stage, metastatic castration-resistant prostatic cancer approved by the USDA (Kantoff et al. 2010, U.S. Food and Drug Administration 2010). However, the cost of this treatment (approximately $90K per course of treatment) makes it prohibitive for most.
- Viral vectors engineered to express tumor antigens are introduced into the patient in the hope that as the immune system, responding to the virus, will also mount a defense against the tumor-specific antigens that the virus presents. The idea is to get around the poor responsiveness of the immune system to “self” antigens in certain types of cancer (Speiser et al. 1997).

(Continued on next page)
Dr. Nelson ended his seminar with a glimpse into the usefulness of the high throughput sequencing techniques – collectively referred to as “next-generation sequencing” – that have revolutionized the ability to characterize neoplasia at the genomic level. The potential impact of such molecular data on cancer research is enormous. Genomic heterogeneity between breast cancer patients (Fig. 4) now provides a potential handle for personalized immunotherapy, where the immune system can be challenged with specific peptides (derived from the tumor-specific genomic sequences) early in the cancer development stage, or even before cancer is detected. In recent months, sequencing data from patients with lymphoma, breast cancer, and ovarian cancer have revealed inter-tumoral heterogeneity and the speaker expressed optimism regarding the development of individualized and tumor-specific immunotherapy utilizing these gene-level differences (Fig. 5). It seems, however, that more research into this avenue is required given that a single population of transformed cells in the same neoplasm may show DNA sequence heterogeneity (reviewed in Navin and Hicksa 2010).

Dr. Nelson invited his audience to keep looking toward a not too distant future where “Personalized Immunotherapy of Cancer” is going to be part of the regular arsenal at our disposal. However, he also reminded his audience that prevention still remains the best option.

Dr. Nelson has generously allowed HAPS to post the PowerPoint of his conference talk. It is available at the haps website: [www.hapsweb.org](http://www.hapsweb.org). Click on conferences, archives of past conferences, 2011 Victoria conference. Member login is required.

**References**


Whales have much to teach us about anatomy, physiology, and unique adaptations for life in the sea. At the 25th Annual Conference of HAPS, Dr. Wayne Vogl shared some fascinating facts about cetaceans and some of their very unique anatomical structures.

Dr. Vogl’s presentation focused on 2 systems: blood supply to the brain and spinal cord in cetaceans and the mechanics of jaw suspension in rorqual whales. He began with the normal anatomy in humans of each of the systems and followed up with differences in cetaceans.

In humans and most other mammals, the brain is directly supplied by the internal carotid arteries and vertebral arteries. These join inside the cranial cavity to form the cerebral arterial circle, which supplies blood to the entire brain. The cranial venous sinus drains the brain and orbital regions. This venous plexus is close to the nasal cavity (but not directly connected to it); this becomes significant when comparing the anatomy of whales to humans. Another point Dr. Vogl brought to our attention is the fact that the spinal cord of humans occupies a significant portion of the vertebral canal. The human spinal cord is primarily supplied by intersegmental arteries. Cetaceans show a very different arrangement, as we shall see.

Other mammals (ungulates, such as sheep, ox, goat) have developed different patterns of circulation, where a rete is formed from incoming blood vessels supplying the brain; this carotid rete, which is composed of arteries, is mainly inside the cranial cavity. Venous blood surrounds the rete, and a countercurrent mechanism for thermoregulation is essentially formed. In these animals, as well as in the cetaceans, the internal carotid has become diminished in the region of the cranial cavity.

Beluga whales and Narwhals were the species of focus for CNS blood supply. Dissections and research have shown that in cetaceans, the internal carotid becomes degenerate at the level of the jaw. In contrast to other mammals, these animals have an extensive rete system (the rete mirabile) in the thoracic cavity which supplies the entire CNS. The rete mirabile exists in the fascial planes of the neck, thorax and lumbar regions. Grossly, these retia look like spiraling “worm like” structures. (Fig. 1) They form a fantastically intricate network of highly elasticized arteries embedded in fatty connective tissue. (Fig. 2) Interestingly, there are no veins associated with these arteries, which arise from the intercostals arteries. The retia supply the spinal cord.
and ultimately the cranial cavity. Within the vertebral canal, the spinal cord occupies only a small part of the space, the remainder of the canal being filled with rete structures that surround the cord. (Fig. 3) These retia pass through the foramen magnum and supply the brain via the carotid rete. There are no veins (as opposed to the human and ungulate models). The carotid rete then supplies major vessels that follow a pattern similar to the human cerebral arterial circle.

Cetaceans are the only marine mammal to have this unique structure. Current ideas to explain the existence of the retia (and reasons these ideas may hold little credence) are:

1. they have a thermoregulatory function (but there are no veins closely associated with the arterial structures).
2. the rete may fill non-collapsible air spaces when these whales are at extreme depths (but they are found in places where there are no collapsible air spaces)
3. they may serve as blood oxygen reservoirs (but blood capacity of the rete is only 1-3%)
4. they may have a pressure dampening effect maintaining blood flow to the CNS despite increased pressure during diving and a subsequent drop in heart rate (but cetacean are not the only diving animals, despite being the only marine mammals known to have retia).

This 4th idea is currently the most accepted to date. Data is scarce and research on these animals is difficult.

In the second part of the presentation, Dr. Vogl focused on a group of cetaceans known as rorqual whales, which practice a method of feeding called “lunge-feeding”. First, a review of the human jaw; it is composed of the mandible and temporal bone connected by a classic synovial joint. The mental symphysis is normally completely fused. Our jaws are mainly designed for chewing. In contrast, the cetacea (>80 species) has members within the suborder Mysticeti, family Balaenopteridae (the Rorquals) with a very different anatomy.

Rorquals are baleen whales and are characterized by parallel lines along the lower jaw region. Blue whales and humpbacks are in this group. The lines were formerly thought to be a streamlining feature. It is now known they function in lunge-feeding. As the animal feeds, it moves towards its prey (this being krill, a tiny shrimp-like crustacean) and opens the jaw, with more than 2/3rds of the cavity filling with water. The external lines allow stretching and expansion of the lower oral cavity. These baleen whales can open their jaws almost 90 degrees as they take in these huge amounts of water filled with krill as they feed. When the mouth is closed the krill are filtered through the baleen.

The temporomandibular joint of these lunge-feeders is unique. The mandible rotates laterally and externally during feeding and, more interestingly, there is no synovial joint between the mandible and temporal bones. Instead there is a huge ligament directly connected to both bones. This probably supports the stress placed upon the jaw during lunge-feeding. There is another structure recently discovered near the mental symphysis. Its purpose and composition are still being studied; it could be a synovial structure or have a mechanoreceptor function.

(Continued on next page)
Photos and videos of these magnificent creatures provoked many “oohs” and “aahs” as we witnessed the breathtaking event of what to a rorqual, is simply another meal. (see references).

Dr. Vogl’s presentation was a delightful detour from the usual discussion of human anatomy and gave HAPSters some interesting facts and provoking questions to consider as we compare human anatomy with that of some of the largest creatures on the planet.

Dr. Vogl has generously permitted HAPS to post a pdf of the images in his talk. You can access those at www.hapsweb.org. Click on the meetings link on the left, annual conferences. Look for the links to the 25th annual conferences under archives of past conferences.

Additional information:


http://www.youtube.com/watch?v=fOMzFFh3rEA

Figure 4: Comparison of rorqual jaws before and during a lunge feed.

Cyrus Avery, the “father” of Route 66 -- the Mother Road, was a businessman and entrepreneur from Tulsa. Nearly 435 miles (695 km) of Rt. 66 are located in Oklahoma, more than any other state.
Brown Adipose Tissue and Its Role in Adaptive Thermogenesis: Could this be the key to maintaining healthy body weight throughout life?

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Is it possible that adult humans carry in their DNA the key to maintaining healthy levels of body fat and sustaining lean body mass throughout their lives? Recent research has confirmed the presence of brown adipose tissue in adult humans. Spending time in cold temperatures activates it and it has the unique ability to burn up calories instead of storing calories as white adipose tissue does. Does this mean that maintaining healthy body weight may be simply a matter of spending more time in the cold? Recent research indicates that the answer to both of these questions is a resounding “maybe.”

Most of us are very familiar with the more abundant white adipose tissue that functions as insulation, acts like a shock absorber, and forms subcutaneous padding in adults. Commonly found in the belly, the breasts, and the buttocks, most adults would like to have less of it because it is not a metabolically active tissue and it tends to accumulate in thicker layers as the body ages. Brown adipose tissue, however, is an extremely metabolically active, highly vascularized tissue previously thought to exist only in human infants and certain small mammals. Located in the shoulder region, the upper neck, and the back, its job in infants is to help maintain body temperature in those who are too young to have sufficient muscle development to be able to sustain body temperature by shivering; the process is known as non-shivering or adaptive thermogenesis. Numerous mitochondria present in brown adipose tissue not only give the tissue its characteristic color but also have the ability to release energy rapidly when stimulated by the sympathetic nervous system, thereby warming the extensive blood vessel networks in the tissue and ultimately warming the body as blood leaves brown fat deposits and joins systemic circulation. The two types of fat differ as much in outward appearance as they do in function. White adipose tissue is a loose collection of adipocytes in which each cell contains a single, large droplet of fat. In brown adipose tissue, fat is stored in numerous cytoplasmic vacuoles inside adipocytes, giving the tissue a more mottled, mosaic appearance. Brown adipose tissue varies in color from light pink to dark red depending on its fat content, and individual adipocytes are polyhedral in shape and much smaller than white adipocytes. Cell nuclei are centrally located in brown adipose tissue, a great deal of cytoplasm is present in the cells, and mitochondria are round and exceptionally large. In humans, deposits of brown adipose tissue generally lie within white adipose tissue forming what is known as “brite” (brown and white) adipose tissue (Cannon and Nedergaard 2004, Fruhbeck et al. 2009, Martini et al. 2012, Nedergaard 2007).

It has been known for over 40 years that brown adipose tissue is capable of producing heat in animal systems, especially during the winter months. When animals are exposed to cold, the sympathetic nervous system is able to increase the animal’s metabolic rate by as much as 30%. Non-shivering thermogenesis increases as the metabolic rate increases, and more calories are consumed in order to maintain body temperature. In response to all of this, it has long been noted that animals appear to be hungrier in the winter than they are in the summer. In spite of this knowledge, brown adipose tissue has become the object of intensive research only recently as PET scans and other nuclear medicine diagnostic scans confirmed the presence of significant amounts of tissue in adult humans that looked like fat tissue but did not have the storage and cushioning properties of normal fat. Nuclear medicine diagnostic scans have revealed that the amount of brown adipose tissue in adults varies from person to person, but subsequent studies strongly suggest that adults who have significant deposits of brown fat are different from those who do not; they are both younger and leaner than their peers. For reasons that are not yet understood, adults who are taking beta blockers are less likely to have brown adipose tissue, as are those whose diagnostic scans are done in the summer months. The largest deposits of adult brown adipose tissue have typically been seen in young, lean individuals whose diagnostic scans were done in the winter. Cypess (2009) reported that it is likely that

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more than half of all men and women have at least 10g or more of brown adipose tissue. Interestingly, his research also suggests that the capacity to increase both the mass and the activity of brown adipose tissue is greater in women than in men. Findings such as those prompted researchers to take a closer look at adult brown adipose tissue in humans in the hope of learning more about its physiological characteristics (Cannon and Nedergaard 2004, Cypess et al. 2009, Lichtenbelt et al. 2009, Saladin 2012).

The mechanism of heat production in brown adipose tissue was first described by Ricquer’s group in the 1970’s (Riquier 1976). They found that a mitochondrial protein cascade triggers heat production in brown adipose tissue when unmyelinated sympathetic nerve endings from nerve bundles that lie on the intercostal muscles stimulate brown adipose tissue by releasing the hormones epinephrine and norepinephrine into adipocytes. These hormones bind to beta-adrenergic receptors on the plasma membrane of brown adipocytes triggering lipolysis, which releases energy and heat from the mitochondria (Kopelman 2010). The production of heat is made possible through a unique uncoupling mechanism in the mitochondria of brown adipose tissue that separates respiration from ATP synthesis so fatty acids that would normally be stored are instead burned off as heat. This process is known as adaptive thermogenesis or non-shivering thermogenesis. Current estimates indicate that as little as 50g of maximally stimulated brown adipose tissue could account for as much as 20% of the energy produced by adult humans each day. An uncoupling protein, known as uncoupling protein 1 (UCP1), must be present in order to facilitate the uncoupling mechanism. Currently UCP1 is one of the key diagnostic features of brown adipose tissue and can be easily located through the use of a molecular marker. There are several other uncoupling proteins found in brown adipose tissue including UCP2 and UCP3, but they are thought to have very little physiological significance (Cypess et al. 2009, Ricquier and Bouillaud 2009, Zingarettie et al. 2009).

Studies done on mice first indicated that brown adipose tissue, located in the interscapular region, the cervical region, and the supraclavicular region, is activated by cold temperature (Fruhbeck et al. 2009). Studies performed by Lichtenbelt et al. (2009) confirmed that cold temperatures also activate brown adipose tissue in humans. Of the 24 young male human subjects that Lichtenbelt exposed to cold temperatures, 96% showed activation of brown adipose tissue. His studies also brought to the forefront the unexpectedly high number of adults who have significant amounts of brown adipose tissue and confirmed the presence of less active brown adipose tissue even in overweight or obese subjects, which raised questions about whether brown adipose tissue might be targeted for obesity treatment in the future (Lichtenbelt et al. 2009).

Numerous studies carried out in the 1990’s demonstrated that brown adipose tissue plays a role in total body energy homeostasis and weight control in mice. To determine if brown adipose tissue could be used to prevent obesity in mice, two groups of experimental animals were used: one group consisted of mice with uncoupling protein intact and a second group consisted of knock-out mice with an uncoupling protein ablation. Body temperature, food intake, food assimilation, body weight, and metabolic rate were measured in both groups of mice. Precise amounts of food were given to the mice each day, and daily experimental measurements were made. The results of these studies indicated that there were no differences between the two groups with respect to locomotion, food assimilation, and metabolic rate, but that body weight and body composition were significantly different after 30 days. The mice without uncoupling protein were about 70% heavier than the mice with uncoupling protein and showed severe signs of brown adipose tissue depletion. Mice without uncoupling protein also had a much lower body temperature. Results suggested that mice without uncoupling protein became obese because the depletion of brown adipose tissue allowed fatty acids to be stored in the body while body temperature dropped because brown adipose tissue was no longer able to convert fatty acids directly to heat. The manipulation of the brown adipose tissue was the only variable in these experiments (Klaus et al.1998).

Studies with mice have revealed a mechanism by which it is possible to switch myoblast progenitor cells and white adipocytes to brown adipocytes through the use of a protein found in brown adipose tissue known as PRDM16. PRDM16 is known to stimulate the brown adipose tissue phenotype and induce the expression and activation of brown adipose tissue proteins such as UCP1. Many researchers believe that such a switching mechanism also exists in humans and that if they can master the switch, they may be able to find a way to increase the amount of brown adipose tissue in people who don’t have very much of it, which might eventually be of value in the fight against obesity (Fruhbeck et al. 2009, Kajimura et al. 2008, Seale et al. 2007, Virtanen et al. 2009).

Currently, obesity research centers on ways to help people consume fewer calories, but in the wake of research into brown adipose tissue, new classes of drugs may be developed that will be able to increase brown adipose tissue activity and make it possible for obese individuals to burn the calories they take in more quickly. The stakes are high for everyone involved in anti-obesity research, and there is a great deal of interest in finding new drugs that may be effective in the fight against obesity. The fact that brown fat is found in large amounts in young, lean adults, that it is activated by cold temperatures, that it allows calories...
to be burned off instead of stored, and that a molecular switch may be present to convert white fat to brown makes this area extremely interesting and challenging to those who are in the front lines of anti-obesity research.

The genes for activation of brown adipose tissue appear to have come to us with our mammalian heritage along with mammary glands and hair. Other mammals have made use of brown adipose tissue during hibernation, in surviving nocturnal and seasonal cold, and in surviving the cold stress brought about by the birthing process (Cannon and Nedergaard 2004). Perhaps humans will soon be able to add another dimension to the list of survival tactics associated with brown adipose tissue as they learn how to turn it on in increasing amounts in order to stay fit, trim, and lean into adulthood and beyond, maybe even into old age.

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References


Ricquier D, Bouillaud F. 2009. The Uncoupling Protein Homologues: UCP1, UCP2, UCP3, StUCP, and AtUCP. Biochem J. 345:161-179.


Fill the Bucket At Home, Then Stir It Up in Class

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“OK, Class... regions of the lower limb... please refer to the massive PowerPoint slide above my head.

“OK, this is the gluteal region, and this part here is the femoral region. Please do not call this region the leg; it is either the thigh or the femoral region. Moving inferiorly we have the patella or kneecap.

“OK, Class, what was the region just superior to the kneecap? Class? Class? Anybody? Anybody?”

Tradition tells us that the instructor needs to say everything that a student should know in a class. Do students need to know the location of the femoral region? Absolutely! Well, then the instructor had better say, “This is the femoral region of the body.”

Saying everything that needs to be known by the students in an anatomy course leads to a lot of talking -- and a lot of repetition if you are teaching more than one section of the same course. Thank goodness for PowerPoint: that makes spouting out facts and details of human anatomy and physiology much easier and gives students cool graphics to look at while their brains try making sense of the torrent of information coming from the front of the room.

Point to ponder: Is verbalizing information the essence of our jobs? Is this one-way flow of information the critical feature to what we call teaching? Of course not.

Cognitive science is a relatively new field when compared to physics and even anatomy, but a few principles have been established. For example, we know that students can memorize a bunch of facts... femoral region, organ of Corti, temporal lobe, oligodendrocytes. Putting all those terms into the brains of our students is analogous to filling a bucket with water – and just about as easy when you have students who can memorize.

But cognitive science also tells us that there is much more to learning than memorizing and, thus, more to teaching than filling students’ brains with facts and details. There exist in our students potentially cool cognitive phenomena such as questioning, understanding, innovation, and creativity, to name a few. But these features of learning typically fall to the wayside because we feel the need to fill the bucket. We settle into our teaching default mode and lecture and show PowerPoint slides. But wouldn’t it be nice if we did not have to verbalize everything in class? Wouldn’t it be nice if students could learn the easy stuff at home so we could do more engaging activities in the classroom? Many of us have tried: “Tomorrow we’re starting the muscular system so please read Chapter 7 before coming to class.”

Ever said something like that? Ever feel like nobody is listening?

Most instructors know that the instruction “Read Chapter 7” is not realistic. Some students (the best and brightest) do indeed have the ability to read and comprehend an entire chapter of an anatomy and physiology text, but most need more help to figure out the difference between fascicles and sliding filaments.

Homework in college science courses has historically meant reading the text, but textbooks are far from easy reading. They are indeed high quality, full of rich information and wonderful graphics, but for the average student reading an entire chapter of the text is just not realistic. (“Dude, TMI!”) Without the threat of a pop quiz or test, most students don’t bother “reading Chapter 7” because they know the instructor will be lecturing on the topics they need to know.

Students can indeed do homework prior to a regular day in the classroom, but that homework must be directed toward specific tasks and objectives – much
more so than “Read Chapter 7.” Pre-class homework can be in the form of simple chapter guide worksheets. For example, a worksheet may query:

**Introduction:**
Chapter 7, Part 1: Energy requirement for muscle contraction.

Tomorrow in class the main concept will be energy requirement for muscle contraction. Below are four questions that you need to be able to answer prior to class. You can find the information in Chapter 7 of your text.

Write one or two paragraphs for each of the following questions.

1. Compare and contrast aerobic and anaerobic respiration. Where do these events occur?
2. What are creatine and creatine phosphate? How do these two molecules relate to energy production within a muscle? What do they do?
3. What causes muscle fatigue? Specifically, what is the role of ATP in muscle fatigue?
4. What is lactic acid? How is it produced? How does lactic acid relate to oxygen debt? What is oxygen debt?

Most all of us have lectured on these topics; they’re not all that difficult and most of our students could learn the material simply by doing a worksheet while reading the text.

But will students do the work? Will they complete their homework? That depends on the instructor and on the expectations of the course. If the assigned readings and worksheets “have teeth,” then students will indeed complete the assignments. “Teeth” in this case means that the instructor does not lecture on the same material the next day. If students are indeed held responsible for the material that they learned at home, they will realize that they must do their homework prior to class – that they are expected to “fill the bucket at home.” Psychologists call this process conditioning, but most instructors know it as “learning to become a student.”

**Fill … then stir….

When students learn the easy stuff at home, that opens time in class for more advanced and engaging classroom sessions. Instead of lecturing on aerobic and anaerobic respiration, students can, for example, discuss the relative merits of athletes taking creatine supplements, or maybe review research studies on the role of lactic acid and muscle fatigue. And by pursuing deeper questions and concepts in class, students stir up the factual information in their brains and start tying ideas together into larger concepts; they begin to build understanding. And at the same time, the instructors have made a big step from mere bucket fillers to knowledge builders – they have become constructivists!

The constructivist view of learning has many components, but at its core is the notion that students must create, or build, their own understanding. The job of an instructor is to create an environment where students use their knowledge to describe, predict, and explain events and problems; the instructors become less bucket fillers, and more bucket stirrers. Less lecturing, more questioning. For example, instead of lecturing on the role of aerobic and anaerobic respiration, the instructor can pose situations such as the following.

The winner of this year’s Boston Marathon ran 26.2 miles in just over 2 hours and 2 minutes, and when he crossed the finish line it did not look like he was even in oxygen debt – he was not breathing hard. Meanwhile, a “normal” person might run only 100 feet to catch a bus and then double over in pain and be in severe oxygen debt. Compare the Boston Marathon winner to the regular person in terms of aerobic and anaerobic respiration, lactic acid accumulation, and any other factors you think contribute to being “in shape.” Work in groups of two or three and in ten minutes send me an email with your answers and I’ll show them to the class. We’ll critique them.

For ten minutes you’ll hopefully see a constructivist learning environment busy with brainstorming, ideas, and even arguments – tools for stirring the bucket. And during that time the instructor gets to walk around the room and monitor progress, induce doubt in the overconfident students, and give guidance to the lost. And after ten minutes, the instructor should have emails that can be displayed and publically reviewed. “Who wrote this one? This is good.” or “Who wrote this one? What were you thinking? This is just plain wrong!”

Stirring the bucket (i.e., engaging in constructivist classroom activities) is something that should not be started on the tenth week of the course. If it is to be done, it must be started on the first day of class, and it must become a normal, every-day, classroom activity. Discussions, brainstorming sessions, public presentations, and critiques should become ordinary.

Most students are willing and able to do the work. They are willing to “fill the bucket” at home if we are willing to re-design our courses to include more structured homework and to develop classroom activities that allow students to use their knowledge in creative ways.

Wow. Sounds like work.

It is. But it’s worth it.

■

(TEACHING TIPS SECTION CONTINUED ON NEXT PAGE)
Psychologists assert that a first impression is made within seconds of an encounter. This observation has led me to think hard about the first day of class. How can I kick off the semester on that proverbial right foot? As we all prepare to launch, I have the following reflections to tender.

1. **Lead with strengths**

   In my first encounter with students I want to showcase something powerful, preferably something riveting. I believe this principle applies both to instructional techniques and to curricular content.

   First, what effective traits do I have as an instructor? How can I employ them to light the fuse on day one? For example, if I have amassed a fabulous collection of images from the history of anatomy, I want to let students take a peek right away. Or if I am facile with group dynamics, I want to instigate a directed discussion on that first day.

   Second, how can I explore specific content as we open the door on our semester's work? This means actually doing some A&P. Not next week. Now.

   I venture to guess that most of us do the administrative tango on the first day of class. Hello my name is and you are? Further, I will bet we debut with the most inspiring, engaging tool we have… the syllabus?! I personally never do a review of the syllabus as the key event of my first class. That document, while significant, is a dour piece of work. The syllabus sends the clear signal of who is in charge (you) and draws that stark line in the sand (what constitutes an “A” and what does not). An administrative first day smothers the spirit of learning, I think. It does not distinguish your first day from any other generic first day your students attend during the start of term, and perhaps their start in college.

2. **Imprint your students**

   Remember the behaviorist whose ducks hatched, motherless, and then locked onto him as a surrogate mom? He soon had them waddling along behind him around his garden, mimicking his lead. He set the tone, as it were. How can we imprint our students on us in a similar fashion as exemplars of effective, active learning behaviors?

   I believe we have to embody our expectations. Do we want inquiring minds? We need to pose open-ended questions and wait for answers. Really wait. Then stay with those answers and follow them through. We can let an important question dangle, say, at the end of class. Implicit is the notion of ‘think about it and we’ll get right back to this when class reconvenes.’

   I want to conduct the first day as a microcosm of the classroom dynamics I want to cultivate during the entire semester. At least, I want to suggest what a vital, engaged classroom looks and feels like.

3. **VARK it!**

   VARK is an acronym for multisensory learning. If you have not run into this term, it stands for Visual, Auditory, Reading/Writing, and Kinesthetic styles (Fleming 2006). Controversy exists about learning theory and whether individuals are distinct, different kinds of learners. However, a multisensory teaching style has great pay-offs. Do your younger students have short attention spans? Switching modes keeps them engaged. Employing various teaching styles also helps students hone the foundational skills of observing, listening, speaking, and composing. Finally, VARKing makes learning lively. Gravitas is important. But fun has benefits, too.

4. **Forge a contract**

   My colleagues in Education talk about the need to shift from an instructional paradigm to a learning paradigm (Barr and Tagg 1995). Their message is to consider creating a learning community together with your students. You clarify your role and responsibility as instructor and discuss the students’ roles and responsibilities. Establishing this contract on the first day of class – and emphasizing it in the syllabus – sets a collaborative tone from the start.

5. **Identify ‘Big Ideas’**

   The longer I teach A&P, the more patterns and themes I perceive. I do not think these are obvious to students a priori. But it is a thrilling breakthrough for students to catch on. In my first class we start a lexicon of Big Ideas. ‘Form follows function’ is an early one. Others
will follow. ‘Homeostasis maintains health’. ‘Opposite and complementary pairs exist’. ‘This is the pattern of increased surface area’. Students define these “big ideas” and log examples of them as we continue through the course.

The first day of class ought, in my opinion, to be one of the highlights of the course. If you have taken advantage of the opportunity, you will have unleashed something: the contagion for learning.

References


More than just prairies and plains, there are 11 ecoregions – making Oklahoma one of only four states to have more than 10. Twenty minutes from Tulsa, the Keystone Ancient Forest Preserve in the Crosstimbers, is a virgin forest of record breaking 300 -500 year old post oaks and red cedars.

Penguins, six feet tall, made of fiberglass, and whimsically decorated, can be spotted throughout Tulsa. The penguins were part of a fundraising event for the Tulsa Zoo and Living Museum’s 75th anniversary.
Building the Basics with EDU-Snippets

EDU-Snippets – A column that survives because you - the members - send in your Snippets

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EDU-Snippets is a column designed to let you, the members of HAPS, share your “ways to make sure your students get it.” Since EDU-Snippets began, our members have been continuously amazed at how many teaching and demonstration ideas pop up and are easily transferred from one instructor to another through Snippets. This edition is no exception. Below you will see some great ideas – fast, fun, easy, and cheap!

Today’s ideas are great for teaching the early concepts in your Anatomy - Physiology sequence. Some, such as the bonding exercises, can be given to students to try on their own. This is an especially good idea for students who are having trouble with basic A and P building blocks.

When I put out the call for ideas for this issue, some interesting “magic moments” came through. Some are included here and some will be in later issues. Some other ideas were also generated from the Haps-l discussion list. Meanwhile, the EDU-Snippets desk certainly encourages everyone to keep right on submitting! This column thrives on what you do – both in lab and in lecture.

I. Slinky Snippet

Sometimes the simplest ideas can really drive home a point. Tama Fox (South Seattle Community College, auntama@gmail.com) came up with a demonstration of just such a point.

Slinky Snippet

Slinky Snippet

Slinkies are GREAT for showing how tension is the force that actually pulls water up a plant. Pull a slinky up vertically. Hold both ends so the students can see what you are doing. Then let go from the bottom and BOINGGG! You can extrapolate this to most any type of cardiovascular concept. You can even ask your students how this works with a giraffe as the animal goes from standing erect (and obviously needing blood in its brain) to putting its head down to get a drink of water. Ask what other factors might be involved. Then ask how this applies to us as humans. This is great for getting the students to see the inter-relatedness of the human systems.

II. Chemically Bonded Snippets

Chemical bonding – of all types – often presents some problems for our students. We have a series of demonstrations that may help get the bonding points across.

A. Roberta Meehan (Maricopa County Community College District, biology@ctos.com) started this out by thinking about a rather simple demonstration.

Students often do not understand the simple (?) concepts of electron transfer and electron sharing. This is a quick and easy way of showing these principles. (Although this experiment can be done with either balls or sticky notes, I am using “ball” wording.)

Have a student labeled “Sodium (Na)” carry a ball (any size) called “Electron” around the room looking for a student labeled “Chlorine (Cl)” who has a sign saying, “Need electron.” When the two meet up, Sodium excitedly hands over the ball to Chlorine and the two walk off shoulder to shoulder – not hand-in-hand! – holding a new sign that says “Sodium Chloride.” They are not hand-in-hand because this was an electron transfer – but they are still best friends.

Meanwhile, have a couple of students each carrying a ball and rigged with signs that say, “Electron to share.” Keep it singular. These students can be hand-in-hand. Another student is walking around with a sign saying, “Willing to share life with two electrons.” The three meet up and share the carrying of one electron (ball) with one hydrogen and share the carrying of the other electron (ball) with the other hydrogen. They all share in carrying a new sign saying, “Water.”

I am certain you can see the multitudinous directions you can take with this simple idea. I especially like doing it with dehydration synthesis and hydrolysis. They are fast and easy demonstrations and the visualization “takes” with students.

(Continued on next page)
B. David Evans (Penn College, devans@pct.edu) went one step further with similar ideas to help with this concept.

Students often have a hard time relating to chemical bonding. I usually have students do role-playing: for example, for ionic bonding, someone gets to wear a “hydrogen” sign with a small “electron” sticky note attached and another student gets to wear a “chlorine” sign. Both signs are reversible and the respective ions are on the back of the signs.

We put the two atoms together and dump them into “water” (a circle on the floor) where the hydrogen hands the electron to the chlorine and then both reverse their signs to become ions.

There are more variations on this theme for covalent bonding but I think you get the idea.

Sometimes folks still do not “get” molecules, so I have a few things the students can do in their study groups. One idea is to use differently colored play dough balls to mimic various atoms. This is easier, but messier, than using colored Styrofoam® balls.

Right now I am looking at a student project on my wall – a model of the thalidomide “molecule” made of these plastic balls. A student presented it to me for part of her student project. I also have a wooden ball “methane” and an “octane” of the same material. More elaborate is a plastic “serotonin.” Molecules like that are too complex for a classroom activity but seem to hit the educational sweet spot for term projects.

One can also use Lego® blocks to make simple molecules: a yellow single post Lego® could be a hydrogen atom and a blue double poster could be oxygen. Here is an audio website (Academic poster could be oxygen. Here hydrogen atom and a blue double make simple molecules: a yellow minute) that has a similar idea: http://www.insidehighered.com/audio/academic_pulse/legos_and_chemistry

You can find a lot more good teaching ideas on the various subpages of “What’s new.” This is a free service to our HAPS members; check the links out as often as you can at: http://www.hapsweb.org/displaycommon.cfm?an=1&subarticlenbr=190

C. Janet Sherman (Penn College, jsherman@pct.edu) had another idea for demonstrating electrical (or electromagnetic) attraction.

I demonstrate the attraction between water molecules using magnetic marbles and glass marbles. I have the students compare the action of the magnetic marbles to the lack of attraction between non-polar molecules represented by the glass marbles. If the two types of marbles are mixed together the magnetic marbles will separate from the glass marbles (oil and water don’t mix) OR the magnetic marbles will form a ring around some of the glass marbles (which can loosely be compared to the formation of a coacervate).

III. Skeletal Snippets

A. Janet Sherman (Penn College, jsherman@pct.edu) also had another idea that may help our HAPS members as the hallowed bone fall fast approaches.

I hand out paper skeletons (from the Dollar Store) and have students label as many bones as they can in five minutes as a pop quiz at Halloween. They get extra credit for spotting anatomically incorrect structures on the paper skeletons.

B. Meanwhile, Bob Rawding (Gannon University, rawding001@gannon.edu) heard about Janet Sherman’s Halloween challenge and came up with three new Snippets. Note that these three Snippets form a continuum – and proceed directly from Janet’s Snippet.

(1) I have been building a collection of miscellaneous toy or pottery skeletons for about 15 years. About Halloween time, we have an A&P I practical exam on the skeletal system. I offer three bonus points for each student who can identify oddities on the toy/pottery skeleton that I randomly set out on one of the practical stations. They get one point per “oddity”, e.g. incomplete rib cage, reversed radii and ulnas, eyeballs in the skeleton’s orbits, skeletons that smile, feet with only four tarsal bones, reduced numbers of phalanges, and so on.

(2) This summer I added a different twist to the skeleton lab exam. I laid out one hand (loosely articulated) as well as right and left radii, right and left ulnas, right and left humeri, and right and left scapulas (scapulae). At that station, students needed to identify from which side of the body the hand was derived, and then write all of the correct bones’ letters (from masking tape with a letter on each, e.g. radius right = A, radius left = B, ulna right = C, etc.) that would complete the entire upper extremity.

This complex question challenges them (1) to identify right or left hand, then (2) to identify all of the corresponding elements of that side of the upper extremity. The big twist is that if they get the hand’s side correct, but erroneously couple it with any of the contralateral side’s bones, they receive no credit at all. At other stations, I ask for bone markings and so on. This particular station is special!

(3) When I get to the muscular system practical, I merely place a whole bone, such as a femur, on the table and ask questions such as (Continued on next page)
• Name four muscles involved in circumduction of this bone
• Name two muscles that abduct this bone or name two antagonistic muscles that move this bone
• Name two muscles from two different muscle compartments of this extremity, and state each muscle’s action(s)

The challenge here is to recall the identity of the bone, then remember the muscles that move the bone, and lastly pinpoint the muscle action(s).

IV. Minimum Number Snippets

So, Terry Meehan (tjimehan333@yahoo.com), on reading about Bob Rawding’s ideas, recalled his own boney idea.

Bob’s ideas made me recall some exercises I do. These are MNI or minimum number of individuals exercises – where the students learn left & right for most bones. I give a particular group a pile of casts and have them tell me what is the minimum number of individuals represented by the pile. The pile is blocked from other students’ viewing and the students are required to mix them up after they finish. If there are seven femora (5 right and 2 left), 4 right patellae, 2 right patellae, 3 right ribs, 2 left ribs, etc, then the minimum number of individuals is 5. These are plastic casts of the about the same stature, so the students don’t need to worry about articulation fits. It is an old anthropology game. (Go zooarch!)

I also have them articulate a left or right extremity from a pile & have them call me over to check it when done.

One of my favorite bone/muscle problems is to have the students name 5 muscles that attach here (originate or insert) or all the muscles that cross this joint (for physical therapy students) or 3 muscles that originate here. Obviously, I teach muscles and bones together. I do a “half” regional approach in my lecture organization.

Another favorite is for physical therapy students. After we do the lower extremity, at the beginning of the upper, I give them a table and ask them to work on it with a partner and try to figure out the analogous muscles/muscle groups, bones, and a few other structures of the upper extremity. It makes them think and gives them an overview of the upper extremity. There is not necessarily one best answer for each muscle/muscle group — and for a few “key” entries, I put “none.” I first explain about standard human and digit position, and we go over some practice examples. We discuss these in class, and a little later I post my “key.”

V. And We Hope You Will....

Keep those cards and letters coming! Thank you all for your EDU-Snippet contributions. The influx of Snippets has been great! Please keep it up because more are always needed! Your ideas are tremendous! If you have thoughts or ideas, or any interesting ways to help our students understand anatomy and physiology, EDU-Snippets would love to hear from you! Once again, EDU-Snippets encourages new submitters to submit – and regulars to keep on submitting!

For the next issue of the HAPS-Educator, send your EDU-Snippet experiences and ideas to biology@ctbs.com as soon as possible. You will also find a reminder on the HAPS-L list. Plan ahead. You can even submit your ideas now and maybe next issue you too will see your EDU-Snippet in print!
Use of Dissection Videos in the Anatomy Lab

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Dissection is considered one of the most challenging tasks of any anatomy lab. Students are expected to perform high-quality dissections, and yet most students do not have any previous dissection experience. These students struggle with learning by merely reading a lab manual and can benefit from additional guidance while building their dissection skills. For this reason, our anatomy faculty teamed up with the campus audiovisual staff to create a series of dissection videos. The videos illustrate a range of laboratory methods, from first day basics like changing a scalpel blade and turning a cadaver to advanced dissection approaches for the extremities, head, neck, and thorax.

Development of the dissection videos involved a number of steps. Preparation began with writing the video scripts and conducting a practice dissection in advance of filming to determine the best camera angles for each cut. We also fully dissected regions of the body in advance to minimize the time taken with the entire film crew present at the actual filming. The process of producing the dissection videos included a three camera shoot and then capturing and editing the footage using Avid Media Composer. Editing the footage allowed us to create the most efficient dissection sequences illustrating the key techniques and anatomical relationships. The process was completed with taping voice-overs, creating graphics with Adobe Photoshop CS5, and video compression.

The finalized dissection videos were posted on the online course management system or course website. The videos are approximately 10 minutes in duration and visually and audibly teach students the landmarks to focus on, dissection techniques, and important anatomical relationships. After the end of the course, students were surveyed for their opinions of the impact the dissection videos had on their success in the course.

Student feedback of the videos was overwhelmingly positive with 68% increased satisfaction in the group of students that utilized the dissection videos versus a control group. Lab scores were 8% higher for the students who viewed the dissection videos versus those who didn’t.

Student comments included statements of increased self-reliance including, “I have greater confidence and understanding of the dissections,” and, “The videos let me know exactly what I need to do.” Many students felt the videos made the dissection protocol more clear, for example, “I couldn’t understand what they described in the book, but the video helped it all make sense,” and, “I didn’t know what to expect and was nervous about the dissection, but seeing the cadaver in the video before lab helped ease me into the experience!” The only negative comment was in regard to the excess time required for viewing the dissection videos, “I ran

(Continued on next page)
out of time and wasn’t able to watch all of the videos.” Overall, the comments were favorable and students were grateful for this additional resource.

While we utilized the audiovisual department for assistance with this task, we have also produced a series of dissection videos with the use of a home video camera and simple software like imovie or Windows Live Movie Maker 2011. Even with little or no funding, this is a useful tool that can be created by nearly anyone. For faculty who do not want to put forth the effort to create their own video series, many free sources are available online including notably good anatomy lab videos from University of Michigan (http://www.med.umich.edu/lrc/coursepages/m1/anatomy2010/html/courseinfo/video_index.html), University of Wisconsin-Madison Medical School (http://www.anatomy.wisc.edu/courses/gross/), Dalhousie University (http://anatomy.medicine.dal.ca/sinha/video/) among others as well as various sources available for purchase.

In summary, we advocate the development and use of dissection videos to help guide students in human anatomy dissection.

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Safety Case Studies: Latex Allergies – Who Would Have Thought?

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Professor Barry was conducting a Human Anatomy & Physiology II Lab that involved the dissection of pig kidneys. In order to demonstrate the anatomical structures of the kidney more effectively, students were provided with pig kidneys that were prepared with a triple injection of latex. The biological company supplying the specimens injected red latex in the renal artery, blue latex in the renal vein, and yellow latex in the renal pelvis and ureter.

Students were appropriately dressed for the dissection lab wearing safety eyewear, disposable gowns, and non-latex gloves. In order to reduce the exposure to any preservatives that were used in prepping the specimens, students were instructed to rinse their specimens under running water. Knives were provided for the students to make longitudinal sections of the kidneys and assistance was provided by the professor when needed.

The lab proceeded without incident, until a student began to experience some respiratory signs and symptoms. This student had an apparent history of latex allergies, and as stated earlier, all students used non-latex disposable gloves for the dissection. The student did not appear to be in any acute distress, but was advised to leave the lab before its completion in order to eliminate the exposure and obtain some fresh air. The student was encouraged to consult with her private physician and follow his/her recommendations for attending future Human Anatomy & Physiology II Labs.

Proper Management of Safety Concerns:

1. The National Institute for Occupational Safety and Health (NIOSH) states that allergic reactions to latex exposure in susceptible individuals may result in skin redness, rashes, hives, flushing, itching, nasal discharge, sneezing, scratchy throat, itchy eyes, asthma (difficult breathing, coughing and wheezing), and possibly shock (rare). Latex allergies may be confirmed with skin and/or antibody testing.

2. According to the Human Anatomy & Physiology Society Safety Guidelines, all students should sign a laboratory safety contract after reading the A&P laboratory safety rules. In that document, students should disclose to the instructor any known allergies.

3. NIOSH recommends that anyone who develops a latex allergy should avoid direct contact with any product containing latex until the individual sees a physician knowledgeable in treating latex allergies. Several of the following items typically utilized in a Human Anatomy & Physiology Lab may contain latex. Some companies are now producing these products with non-latex materials.

Disposal gloves
Blood pressure cuffs
Stethoscopes
Tourniquets
Syringes

Rubber sheaths (diaphragms) in the lung function models
Electrode pads
Safety eye goggles
Rubber aprons

(Continued on next page)
4. Regarding treatment of latex allergies, special precautions are required to prevent further latex exposure. Medications are available to reduce the signs and symptoms of allergic reactions, but latex avoidance is the best solution. Obviously, it is a challenge to create a latex-free environment, but a latex-safe environment would be beneficial to those individuals with known latex allergies. NIOSH also recommends using appropriate housekeeping practices to remove latex-containing dust from the environment.

In the 1820s, the Five Civilized Tribes (Cherokee, Choctaw, Chickasaw, Creek, and Seminole) of the southeast were forced off their ancestral lands and relocated to Indian Territory. This relocation is known as the Trail of Tears. Oklahoma has the largest American Indian population of any state. Many of the 252,420 American Indians living in OK today are descendants from the original 67 tribes inhabiting Indian Territory. Thirty-nine of the American Indian tribes currently living in OK are headquartered in the state.
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