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Cover art: Stephanie Makaula is a wife, mother of three, honor student, and currently
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a physician and researcher in the field of pediatric endocrinology. Her step-daughter, a Type-I
diabetic, is her inspiration for pursuing the combined DO/PhD degree. HAPS member Karen
McMahon knows Stephanie through her role as advisor to the Pi Alpha chapter of Tri-Beta
biological honor society.
HAPS-EDucator is the official publication of the Human Anatomy and Physiology Society (HAPS) and is published four times per year. Major goals of the Human Anatomy and Physiology Society are: to promote communication among teachers of human anatomy and physiology in colleges, universities, and related institutions; to present workshops and conferences, both regional and national, where members can obtain information about the latest developments in the health and science fields; and to encourage educational research and publication by HAPS members. HAPS was established in 1989.

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CONTACT THE HAPS-EDucator Editor: HAPS, PO Box 2945 LaGrange, GA 30241 or hapsed@hapsweb.org.
Greetings from sunny San Diego!

As I write this letter, the HAPS leadership team is preparing for its winter meetings. At this assembly, which is being held this year in Austin, the HAPS Board of Directors and Steering Committee will gather to evaluate their progress since last year’s annual conference in New Orleans. We will also refine our plans and redouble our efforts for 2009. Keep in mind that these committees meet monthly throughout the year via electronic forums, and more recently via Skype. For those of you unfamiliar with Skype, it is free software that allows for free conference calls over the Internet. The convenience and affordability of this tool has allowed for enhanced communication between the Steering Committee and Board of Directors.

The substance of these meetings, however, is of greater consequence. As I reflect on the recent flurry of activity over the last four months, it seems as if a Perfect Storm is forming. HAPS is growing in size and in its programming. The human capital that is HAPS continually proffers ideas for increased opportunities – from HAPS-I courses to web based activities. Supporting the continued growth of our Society with consistent and reliable leadership and institutional memory is imperative. Subsequently, there will be several exciting developments to discuss at the May annual conference business meeting in Baltimore.

It is my intent to present to the membership the rationale behind the establishment of a HAPS Executive Director. This person will work under the direction of our elected Board of Directors so as to see to completion key initiatives. The Executive Director will implement the vision of the Board in tasks such as pursuing grant funding, overseeing website development, and serving to facilitate communication between the Board and ASG, our office services company. The Board will continue to chart the vision and long-range planning of HAPS. The Executive Director will be an assistant to a Board of elected volunteers who regularly cycle out of their roles. This person will also provide institutional memory, ongoing executive leadership, and expertise as a professional who is skilled in running a non-profit organization. This model is consistent with similar professional societies and is a development that I trust will be embraced by the membership.

One other very exciting advance is the continued momentum toward the establishment of a HAPS Foundation. A Foundation will pursue development funds and promote charitable giving to HAPS. Without a Foundation, HAPS is at a disadvantage in the realm of development and philanthropy. At the Austin winter meeting, a detailed proposal that is grounded in legal counsel will be presented, modified, and hopefully approved. At our Baltimore meeting, I plan to present to the membership not only a rationale, but also the bylaws and operating structure for this Foundation. Ratification of this proposal by the membership is also my hope. Keep an eye out for the meeting agenda and more details by the end of April.

Swirling around the eye of this Perfect Storm are many other initiatives. Expansion of the HAPS-I leadership structure, growth of the HAPS-ED towards an electronic vehicle with a completely different format and mission, and additional benefits from our relationships with partner associations.

Steering a ship through such a Storm is certainly challenging. But it is a challenge that I am confident the HAPS leadership is up to.

Finally, I would like to remind you that our Annual Meeting is planned from May 23-29, 2009 and will be headquartered at the Renaissance Hotel along Baltimore’s beautiful Inner Harbor. The Community College of Baltimore County will host our workshops. Please plan on attending and participating in the Monday morning business meeting that will largely surround the Executive Director and Foundation matters. I find it ironic that the logo for the Baltimore conference depicts our Society mascot sailing a ship!

On behalf of the entire HAPS Board of Directors, I wish to extend our sincere gratitude for your support. Do not hesitate to contact your regional director if you have any questions or concerns about what I wrote to you today. Contact information for the entire Board of Directors is listed beside the table of contents of this issue.

Best to you all, and I hope to see you in Baltimore!
As you read this, our conference-related courses will have already started their online work in preparation for several days of seminars and workshops at the HAPS 2009 Annual Conference in Baltimore. I suspect that all will again be completely filled, or close to it, considering that as I write this course registration has only been open for two weeks and we are already about half filled!

Perhaps you haven’t heard, so I’ll let you in on a secret . . . the HAPS Institute courses fill very rapidly!

Even when we add more courses to our growing list of offerings, they just fill right up! Why is that? Well, this part is no secret at all. Our short, flexible, graduate biology courses meet many of the needs of anatomy and physiology faculty all over North America. And there are many thousands of us.

Most of us do not have the educational training we would have liked because most of us never realized that we would spend any part of careers teaching A&P. So many of us came into this from backgrounds in zoology, ecology, cell biology, or other areas of biology. Others came from a clinical background, rather than from the basic sciences. Still others came from even farther afield such as chemistry or physical science. But even among those of us with a degree concentrated in human biology, many are strong in physiology—but not so much in anatomy. Or strong in anatomy—but not so much in physiology.

Even for those of us who have a strong background in human anatomy and physiology, we cannot possibly keep up with all the new developments in all the diverse subjects that we teach over the span of a career. Most of us are barely able to stay on top of the changes that appear in new textbook editions. ALL of us need refreshing in most, if not all, areas of human anatomy and physiology from time to time.

Another part of why HAPS-I courses fill the needs of most of us has to do with the processes of teaching and learning. If you are reading this, you are a member or friend of HAPS. And, therefore, you are part of a self-selected group who are truly concerned about being the best teacher you can be—and want your students to be the best students that they can be. This outcome is incorporated into the design and implementation of each and every HAPS-I course.

Besides providing essential core concepts of particular topics of A&P, we build into each course the opportunities to experience and learn and practice and develop new or different ways of teaching and learning A&P. That is why every HAPS-I scholar in every course is required to apply his or her new learning by creating a teaching object that can be used by other A&P professors. That is also why we use the “learning community” approach of collaborative learning in our courses—we want to facilitate the growth of your personal network of A&P teachers who can continue to share and learn from one another long after the course is over.

As we seek to meet the needs of HAPS members, we have found that there is a great need for cadaver-based review courses in anatomy. Many undergraduate A&P teachers have either limited or no experience learning anatomy by using a human cadaver. So thanks to an Educational Outreach grant from our friends at the American Association of Anatomists (AAA), we will soon be offering a pilot course in Anatomy of the Abdomen and Thorax. This course will involve online learning activities that occur before and after a weekend workshop at a cadaver lab sometime in 2009. As I write this, details are still pending—so if you are interested in taking this course, make sure you are on our email list!

We plan to later follow up with other short, cadaver-based, anatomy review courses, such as neuroanatomy, using a similar format in 2010 in the Chicago area. If you have a cadaver lab and a strong interest in teaching this type of course, let us know.

The best way to find out specific details of HAPS-I courses is the HAPS website at wwwhapsweb.org. Simply click on the HAPS Institute link in the left menu bar! Most of our courses fill rapidly once they open. To get the earliest possible news about developments in the HAPS-I program, sign up for our HAPS-I Update email list at http://groups.google.com/group/haps-i-update.
Dr. Topp spoke about peripheral neuropathy, a pattern of damage to nerves that involves several different types of pain (burning, stabbing, tingling) as well as numbness. Peripheral neuropathy begins and is most severe in the feet and hands, but can spread proximally toward the spinal cord. The lack of sensory information from the numbness often results in impairment of motor functions including weakness, a lack of tendon reflexes, and problems with coordination and balance. Peripheral neuropathy is a common side-effect of cancer chemotherapy. It is also a frequent symptom in diabetics, AIDS patients, and people with autoimmune disorders.

Dr. Topp began with a brief introduction followed by a survey of the most common types of cancer in males and females. She then focused on breast cancer, the most common type of cancer in women. Estimates are that 1 in 8 women will get breast cancer: there are approximately 250,000 new cases in the USA each year and over 2 million survivors. Peripheral neuropathy is very commonly experienced among this large population of breast cancer survivors.

**Drugs used in cancer chemotherapy**

Dr. Topp summarized the major classes of drugs used in treating breast cancer. These drugs are all very cytotoxic; the therapeutic goal is that these drugs may be able to stop the rapidly-dividing cancer cells while not harming normal body cells. Unfortunately the drugs have a number of significant side effects. Many of the drugs also display a cumulative dose effect: once a critical cumulative dose is reached, the frequency and severity of side effects goes up markedly.

One class of drugs is a group of platinum compounds that inhibit DNA repair and trigger apoptosis. These platinum compounds are used to treat a wide variety of cancers. The drugs initially are very successful at blocking tumor growth, but tumor cells often develop resistance to them. Besides peripheral neuropathy, the platinum compounds cause a number of other neurological symptoms, including a variety of sensory and motor problems. These drugs also often exhibit a property called “coasting”, wherein peripheral neuropathy can continue for months after chemotherapy has ended.

A second class of drugs is a group of Vinca alkaloids isolated from periwinkle plants. Vinca alkaloids block microtubule assembly, inhibiting mitotic spindle formation and thus cell division. Since microtubules are involved in many other cellular functions, Vinca alkaloids have numerous side effects. Peripheral neuropathy is a frequent side effect and is often followed by development of various motor problems. Neural signals traveling via the cranial nerves are often impacted.

A third class of drugs is the taxanes - related to Taxol isolated from Pacific Yew trees in the 1970s. These drugs stabilize microtubules, thus blocking microtubule disassembly and cell division. Taxanes are effective in treating a variety of cancers but they also have a number of sensory neuropathy side effects.

An additional class of drugs that Dr. Topp discussed is the anthracyclines. These are antibiotics from Streptomyces bacteria that are very effective in treating leukemia and other cancers. These drugs intercalate between the bases in DNA, blocking replication and transcription. Use of anthracyclines seldom results in peripheral neuropathy, but frequently leads to cardiotoxicity that can appear many years after treatment. Due to this and a number of other side effects these drugs are infrequently used today.

**Clinical Reality - How Is Peripheral Neuropathy Measured?**

Peripheral neuropathy is measured by the Total Neuropathy Score (TNS), which is a sum of values from several criteria and tests. These include patient reporting of symptoms, which are difficult to quantify and compare due to their subjective nature. Sensory and motor tests include a pin sensibility test, tests of deep tendon reflexes, tests of muscle strength, and tests of quantitative vibration thresholds. Values for TNS can be compared with published values for chemotherapy-induced peripheral neuropathy and against values for peripheral neuropathy in diabetics.

Other evaluative criteria include a survey of different types of pain sensations. Chemotherapy patients also often have an impaired sense of balance and, in many cases, the patients are unaware of this effect.

**Animal studies of peripheral neuropathy**

Attempts to study peripheral neuropathy in animal models requires that we measure the animal’s response (or lack of response) to various unpleasant stimuli. Another method is to test the animal’s motor skills as a way of assessing proprioceptor function.

Studies of neuron structure in animals have focused on peripheral nerves, where taxanes seem to have the strongest effects on long unmyelinated axons, and on sensory nerves and the dorsal root ganglion rather than on the spinal cord. This suggests a possible protective effect where myelin and the blood-brain barrier shield...
neurons from drug exposure. Observed effects include a decrease in neurofilaments, swelling of axons, and changes in mitochondria.

Anatomically, the chemotherapy drugs have greatest access to the dorsal root ganglia sensory neurons and to nerve terminals. Morphological changes in these structures were observed in many studies. Studies of transient receptor channels are another way to assess the effects of taxanes on stimuli and chemotherapy drugs have been found to lower their response threshold.

Treatments for peripheral neuropathy

A number of drugs and nutritional agents have been tried to prevent or reduce the severity of peripheral neuropathy. These include antioxidants, acetyl-L-carnitine, glutamine, glutathione, and others. No treatments have been found that work well in all patients.

As we better understand the sensory receptor cells and their second messenger pathways we may find significant variability in the sensitivity of different individuals to the various classes of chemotherapy drugs. Combined with genomic studies, this may allow future clinicians to direct specific treatments to individuals who would most benefit from them.

Current patients can benefit from increased education and symptom management. Education includes training patients to protect their extremities from damage and to use assistive devices for fine motor tasks. Symptom management would include pain control with drugs. It also includes balance training, where patients try to retrain their balance centers to cope with the sensory input they currently receive. Finally, management of conditions such as diabetes that might worsen the peripheral neuropathy is an important factor in long term management.

Review of Workshop 114: The Emergence of Anatomical Eponyms

Judith Gibber, Presenter and Summarizer
Mount Holyoke College
South Hadley, MA

We have probably all used at least a few eponyms in our classes—Eustachian tube, Cowper’s glands, Islets of Langerhans. Gibber wondered how this custom of naming anatomical structures after their discoverer originated. After all, this had not always been the case. The ancient Greek and Roman anatomists created names that were based on a structure’s size, texture, location, shape, function, use, or form. This convention persisted throughout the Renaissance age of anatomy.

To pinpoint the era when anatomical eponyms first appeared, Gibber examined old anatomy textbooks starting with those published around 1700 and going back to the 1543 text of Vesalius. The first instance of eponyms she found occurred in the early 1600s around the time that William Harvey was studying the circulation of blood.

We learned several surprising facts about one of the very first eponyms, Fallopian tube. Earlier anatomists had mentioned such a structure in women, but the details were never clear. Vesalius had drawn it as a coil resembling the male epididymis and called it vasa deferentia. Soon after, Vesalius left his academic position in the Padua Medical School (being a private physician paid better, then, too!)

Fallopius took over as anatomy professor. He gave a clear description of the oviduct in his 1561 book claiming that when he pulled one out and uncoiled it, it resembled the ancient Roman war trumpet, known as “tuba”. So, ironically, Fallopius did not discover the Fallopian tubes but rather described them. He does not seem to have named them after himself since the eponym does not appear until some 50 years after he died. And if he had his way, we would be calling them “trumpets” instead of tubes!

This richly illustrated lecture helped remind us of our predecessors in the anatomy classroom and demonstrated some of the similarities in anatomy instruction over time as well as some of the features that have, thankfully, changed. Although the books described are housed in Special Collections of libraries around the world, many have been digitized and can be viewed online. A long list of URLs was provided, including these two which focus on the textbook drawings:

Anatomia Collection, 1522-1867, University of Toronto, http://link.library.utoronto.ca/anatomia/application/index.cfm
EDU-Snippets

Snippets – from Scavengers to Sounds

A column that survives because you, the members, send us your Snippets

Robert Meehan
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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.” During these past few years of putting together your ideas into our EDU-Snippets column, we have been continuously amazed at how many teaching and demonstration ideas pop up and are easily transferred from one instructor to another through Snippets. The following Snippets came in as a result of a desperate call for more Snippets. The members of HAPS came through with flying colors! Please keep your wonderful ideas coming!

You may notice that only one of the EDU-Snippet team is writing this column. Richard Faircloth, with whom I have shared numerous years of writing – as well as numerous years of friendship – has decided that at the moment he has too much on his plate to continue with EDU-Snippets. After much discussion and much sadness, he has stepped away from our column. He has certainly NOT stepped away from HAPS!! Nevertheless, I and those who make this column work – meaning YOU, the members of HAPS, – wish Richard well. He knows he is welcome to return to this column any time he wishes! His EDU-Snippet ideas have always been invaluable!

Today’s EDU-Snippets you will find especially valuable and especially easy to adapt to your own teaching situations. As always I have done a bit of editing so that the ideas blend together.

I. Scavenger Snippets

This scavenger hunt might be a really good ice breaker for a summer class or for a group of incoming students – those who are a bit timid and unsure of how to approach your college class.

Teresa Alvarez (St. Louis Community College Forest Park, talvarez@stlcc.edu) designed a scavenger hunt for her summer 2008 class. She says that this gets the students out and around campus as well as into the textbook.

I give them 30 minutes to complete the activity and I space them out so that not everyone is going to the same location. They do this activity in groups of 2-4 students and I always make certain that at least one person in the group has a book. They seem quite receptive and I always tell them after we go over the answers that they have no excuse not to visit my office or use the resources that are available to them on campus.

Directions

This Scavenger Hunt is designed to help you understand the resources that are available to you on this campus and in your textbook.

• Please do this activity as a team; do not split up to accomplish this. The purpose is for you to see the campus, not to necessarily complete the assignment.
• After you have completed questions 1-5, come back to the classroom and finish questions 6-13. You will need your text book.
• Please do not ask other teams the answers to any questions; it does not matter if you have a right or wrong answer. The goal of this activity is to get you to see the campus and to use the book.

Questions

1. What is the name of my office (on the door)?
2. How many leg models are in C410?
3. How many chairs are on the right hand side wall as soon as you walk into the student success center? The student success center is located on the second floor of G tower.
4. In the A&P binder in the library, what is the name of the 1st bulleted model? This binder is located in the resource section of the library.
5. What is the call number for the Gray's Anatomy reference book?
6. On which page is information about teaching and learning supplements?
7. On which page is the definition of systemic anatomy?
8. Which page lists the structural organization hierarchy?
9. On which page is figure 1.10?
10. Which page shows you how many regions into which the abdomen divided?
11. On which page will you find the two cavities that are separated by the diaphragm?
12. List two pages on which you will find ATP described as the “energy currency of cells.”
13. Define the prefix INTRA-. Where did you find the appendix that helped you define intra-?
II. Cheating Snippets

Wouldn’t you know it? The whole idea of “cheating snippets” came up on the HAPS discussion list. That brought about a few EDU-Snippet possibilities. Many of you have probably used some form of the “cheat sheet.” Here are three HAPS-samples.

A. Introducing the Cheat Sheet

Alan Magid (amagid@nc.rr.com) sent the following – a very insightful look at cheat sheets.

To increase active scholarship by my students, I came up with the following tactic which students all said they appreciated.

I permitted them to bring a “cheat sheet” to the exam. I encouraged them to put into it all the information they considered significant. The only provisos were that it be a product of their own effort, exclusively, and that it be confined to both sides to a single 8.5 x 11 sheet of paper. I was often astounded at the tiny type, or in some cases tiny hand printing, that their young eyes could read.

To further help them prepare, I told them all the exam questions would be drawn ONLY from the lecture material, all would be multiple choice format, and that I would distribute the questions evenly over the lecture material.

Of course, by allowing a cheat sheet, I had “tricked” them into focusing on the course content, making judgments about what was important, and learning on their own. I had no objection to them working co-operatively but each “cheat sheet” had to be uniquely their own and I asked to have them passed in with their exams.

This tactic produced an immediate, persistent 1/2 grade jump in the exam average with no change in the questions.

B. Alternative Ideas for Cheat Exam

Following Alan Madrid’s ideas, Tom Lehman (tom.lehman@ coconino.edu) had some additional ideas. Tom has also used “cheat sheets” for exams.

I give seven exams over the course of the A&P II semester. For the exam on the digestive system and metabolism, I allow the students to bring in one 5x7 card with notes written on it. When the students show up for the exam, the card goes into an envelope and students to bring in one 5x7 card with notes written on it. When the students show up for the exam, the card goes into an envelope and they only get to use it during the last five minutes of the 30-minute exam. I warn them to study and not just to rely on the card. Overall, they appreciate it.

I have had to add two rules to the card:

• They can write on both sides of the card but the cards must be flat. (I had a student try to add post-it® notes on each other to increase surface area.)

• They cannot use any magnification equipment except for prescription eyewear that they normally use. Someone once printed in 3-point font [Tom included a phrase in 3-point font – too small for us to print here!]. That is tiny, and it is amazing how much they can print out on a card! The student brought a hand-magnifying lens and thus I instituted the rule!

• I have thought about trying it for all of my exams, but have not convinced myself yet that I should expand the experiment this far.

C. Additional Cheat Sheet Thoughts

Roberta Meehan (Rio Salado College, biology@ctos.com) thought about this for a while.

I have used several variations of the “cheat sheet” for one or more tests in both A&P I and A&P II. I always warn the students not to write down what they already know. The first time they have such a test, they have copied virtually everything. A few tests later, the process has helped them to increase their actual study skills – to be selective in what they write down, and to use their copied information as reference points instead of complete answers. Scores always improved dramatically. And, often, someone has said, “You were just forcing us to study!” Duh!!

III. Student Snippets

Some of our HAPS members decided to send some very creative ways of having the students do the initial Snippet work. In other words, the students became the instructors in these easily adaptable teaching methods.

A. Learning the Tissues

Jenny McFreeland (Edmonds Community College, jmcfarla@ edcc.edu) thought about some very simple but highly effective ways of looking at tissues.

This quarter, instead of lecturing on each tissue type (and associated cells and structure), I gave short mini-lectures on general characteristics of tissues, properties of epithelial tissue, etc. Each student in the lecture section (usually 40-50 students) was assigned a tissue, structure, cell, or fiber on the first day of class. They were asked to make a “flash card” that described the structure, function(s), and location(s) of their structure. There are document projectors in the lab and lecture rooms and students were asked to project their flash card and discuss the important points in for a minute or two. As they were talking (by the projector on one side of the front of the room), I made an outline of their main points on the white board on the opposite side of the student. I could then add or emphasize important points for each structure. Students handed in their flashcards which I put in our biology study room so other students could use or copy them.

On a practical note, the only entrance to the lecture room is at the front so I informed the students that they should be on time and that I would be locking the door. I felt that it was important that nervous students not be interrupted during their short presentation. I was writing on the board on the side of the room next to the door and would let late-comers come in between the short presentations.

Students were alert during this early morning class. They got practice organizing material and talking about structure and function at the beginning of the quarter. Students were happy with this experience. They liked the security of a prop (the flash card) that they could just read from if they were nervous. Even the shyest students were not too intimidated by the very short time in front of the class, and all of the students knew the name and functions of at least one structure at the beginning of the lecture. Students also reported that they liked seeing different ways that their classmates organized and presented this information.
B. Building the Tissues

Meanwhile, Terry Meehan (Chatham College, tjmeehan@yahoo.com) sent in three ways of involving students in the process of presenting material.

Sometimes I have students make models with baked or air-dried clay – I’m looking for permanent models. For example, the students can make a 3-D cutaway view of the heart showing all the structures they are to know. Then they can present their model to me or the other lab teacher. The student is to name all the structures, answers any function questions I have, and then tell me the blood pathway (including the valves) from a vena cava to the descending aorta – while tracing it on the model, of course. This is always a bonus assignment (just 10 or 15 pts).

In lab I ask the students to demonstrate to me body actions (I have a stack of action cards!) and to show me origins/insertions on a mounted skeleton (for those few muscles where we learn specific O/I).

I also play a game where each lab table makes up test questions. Each table gets a different topic. The students label everything, write out the questions, set up their portion of the quiz, and make up a key. Then each team rotates around the tables to take the other quiz portions. (Sometimes I set a time limit at each table). Each team is then graded on how well the questions were worded, the correctness of the key, and on the number of questions the team answered correctly. (It is a group quiz.) I usually then have some prize for first place, such as lollipops. This is nice because the students learn that writing precise test questions is not easy, and hopefully, they will learn/reinforce some content. The students also get to see how I set up quizzes as I go over each question and hopefully, they will learn/reinforce some content. The students also get to see how I set up quizzes as I go over each question and make suggestions or get input from other students.

C. Building a Nerve

And Nina Zanetti (siena college, zanetti@siena.edu) sent a wonderfully simple and yet very complete way of building a nerve. Students should love this one. (So should instructors!) Note how Nina explains this.

Use the following materials to build a model of a nerve:
1. clay (mold into small spheres) = nerve cell bodies
2. toothpicks (break into short pieces if necessary) = dendrites (make your neurons multipolar)
3. pipe cleaners (tape several together if necessary) = axons
4. aluminum foil = myelin sheath
5. plastic wrap = CT sheaths (endoneurium, perineurium, epineurium) [best to use different colors for each layer]
6. other materials: pans, cardboard, or lab bench paper to build on tape to hold things together

Be able to use your model to explain and illustrate the following concepts:
1. What are the differences between dendrites and axons?
2. What is a multipolar neuron?
3. What is the myelin sheath and where is it located?
4. What is the relationship between nerve fibers, fascicles, and nerves?
5. What is a ganglion?

IV. Nerve-wracking Snippets

Assuming everyone is happy with the nerve models Nina suggested, it seems quite appropriate that Ken Malachowsky (Florence Darlington Technical College, k.malachowsky@fdtc.edu) would submit two ways to demonstrate nerves in action.

A. Grading the Potential

Instructors often have students do the wave to demonstrate the traveling of an action potential. I like to take this idea to the next step. I start the wave and have the students do it. Every time, when I raise my hands, at first the students just look at me. I do it again and some of the students do it… the wave dies. I do it again and let the students know grades are at stake. The wave goes the full distance. I use this workout to distinguish the short distance nature of graded potentials versus the long distance of action potentials – with the “threat” of grades being the stimulus to reach threshold.

B. A Potential Threshold

Another visual way of discussing threshold is by referring everyone to the hammer that causes the weight to ring the bell at a carnival. Once the bell is hit, threshold has been reached. Anything else is subthreshold. Once the bell is rung, it doesn’t change. All action potentials are the same.

V. The Sound of Snippets

Harold Grau (Christopher Newport University, hgrau@cnu.edu) came up with a snippet that some of you may be able to adapt to your own classrooms.

I am fortunate enough to be teaching my A & P course in a lab that has doors on opposite sides, one that opens out and one that opens in (from the Atrium, no less!). This makes the lab room a good model for the ventricle, (other than the walls not closing in!). When I talk about valves opening and closing because of pressures on the two sides, the students can readily visualize what I mean when I push on the doors. Slamming the door shut makes a loud sound – a heart sound!

VI. And We Hope You Will….

Keep those cards and letters coming! We thank you all for your EDU-Snippet contributions. The influx of Snippets after my plea was great! Please keep it up! Your ideas are tremendous! For the next issue of the HAPS-Educator, send your EDU-Snippet experiences and ideas to biology@ctos.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!
ACT UP!
Activities Completed Today to assess Understanding and Application

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vanhoomi@up.edu

Introduction
“But I studied so hard and I felt like I understood everything!” Have you ever received this response from a student after handing back a test on which his or her performance was less than stunning? If you have, then you can understand one of the major reasons why I have developed and implemented ACT UP in my lecture course in Anatomy. ACT UP stands for Activities Completed Today to Assess Understanding and Application. These in-class lecture activities are immediate, first hand, face-to-face, assessments that inform faculty about student learning and help students self-assess.

The ACT UP framework provides me with the opportunity to address a number of academic and practical goals for my Anatomy lecture course (Table 1). These goals stemmed from the questions I asked myself after each class period, such as: “How can I encourage students to participate during lecture so that I can assess what they know and what they can do without having to sacrifice content? How can I support our University’s mission of excellence in teaching when I stand up in front of my class each morning and gaze out onto a sea of 60 pairs of eyes? How can I engage a diverse group of students that includes freshman nursing majors, upper classmen engineering majors, senior biochemistry majors, biology majors heading off to medical school in the fall, or other upper classmen pre-health students and truly meet their individual educational needs? Is it possible to get all of these students with such disparate educational backgrounds to come together during lecture and engage in our academic endeavor?” The answer is a resounding YES! And the best part is that it can be done without adding unending office hours to your already jam-packed schedule or an insurmountable pile of grading that will leave you exhausted and frustrated.

At our University, Anatomy is a challenging 300-level course that is required for many of our nursing, science, and pre-health students. From 2002-2008 we experienced a 60% increase in enrollment in our human anatomy course, which was originally being taught in a large auditorium that could easily accommodate nearly 300+ students and was designed for performances, not teaching. This large auditorium invited students to disengage during lecture and challenged me to help them assess what they know or their ability to apply the information. To do so, I first attempted to implement the Just-In-Time teaching technique1 (http://jittdl.physics.iupui.edu/jitt; http://jittdl.physics.iupui.edu/sign_on), but I found that this method became overly burdensome for me to carry out effectively in my 120+ student course. Next I implemented a series of in-class lecture activities and take-home group assignments. The outcome? The majority of the students regarded the in-class activities as another opportunity to socialize with their neighbor and the group homework turned into an exercise in group dynamics in which the “group” devised plans on how to invest the least amount of energy into the assignment by splitting up the questions and working independently; they completely missed the point about working together to understand the topics. In addition, I still had no real way to assess whether or not the senior pre-med student was still engaged in lecture or whether the freshman nursing student was feeling overwhelmed by the topics.

My quest for assessing my students’ knowledge and application of the material became heightened when I had an “epiphany” moment and realized that my role in the classroom is to empower students -- to help them take risks and to actually use what they learn in class to think and reason about the subject on their own, without the guiding hand of their professor leading them. If this is what is expected of them once they become health care professionals, why am I not asking them to develop this skill in my class, a relatively safe place where they can make mistakes, correct their errors, consult with their classmates, and ask me for guidance? At this point, I embarked upon a new plan; try to get my students to ACT UP!
Table 1: Goals for the ACT UP.

<table>
<thead>
<tr>
<th>Academic Goals</th>
<th>Implementation Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Assess students’ understanding and application of anatomical concepts.</td>
<td>1. Sacrifice as little course material as possible.</td>
</tr>
<tr>
<td>Ensure that all students from all backgrounds are equally challenged by the activities.</td>
<td></td>
</tr>
<tr>
<td>2. Encourage group discussion and group presentation so that every student must engage and participate.</td>
<td>2. Reduce burden of grading.</td>
</tr>
<tr>
<td>3. Apply anatomical knowledge to solve anatomical problems.</td>
<td>3. Create a familiar and uniform framework for all of the ACT UP implemented during the semester.</td>
</tr>
<tr>
<td>4. Collaborate with classmates to problem-solve and plan solutions to find correct answers.</td>
<td>4. Facilitate interaction between the faculty member and the student.</td>
</tr>
</tbody>
</table>

Implementation

The basic design of the ACT UP is a short 1-3 slide PowerPoint presentation. Each ACT UP is uniquely designed to indentify it as an ACT UP PowerPoint and each PowerPoint is numbered throughout the semester. In general, we complete at least 1 ACT UP for each anatomical system or topic we cover and students are required to complete a minimum of 6 ACT UP during the semester.

To record students work, they purchase a “Blue Book” (a small 10-page book with blank lined paper) from our on-campus bookstore. In Anatomy, the “Blue Books” become our “ACT UP” books. Students are required to bring their ACT UP books with them to every lecture class. At the beginning of the semester, the students divide into groups with four students per group. Each group chooses an “anatomical team name” that they will use for the remainder of the course and they write this name, along with their team mates’ names, on the front of their ACT UP books. They also write their team name and their team mates’ names on a 3” x 5” notecard, which is given to the course instructor. The course instructor will use these cards to easily track group participation.

An example of an ACT UP:

ACT UP #1 coincides with our introductory chapter and consists of two slides. The first slide contains two separate MRI images, one showing a transverse section through the cephalon, and the second showing a coronal section through the thoracic and abdominal regions. The second slide contains a color cryosection image at the level of the feet. All of the images are taken from the Visible Human Project (www.nlm.nih.gov/research/visible/mri.html; www.nlm.nih.gov/research/visible/photos.html).

The following questions are listed on each slide to the right of the image:

1. What plane of section is depicted?
2. What anatomical region is depicted in each image?
3. Provide examples of two different anatomical system(s) that can be observed in each image.
4. Create one sentence that uses correct anatomical terminology to describe the location of two structures in reference to each other.

The students are instructed to work in their small groups to answer the questions. All of their answers are written into their ACT UP books. They are informed that they will be given a discrete amount of time to finish the activity and that several groups will be called upon to report their answers to the entire class. While the students are working, the instructor moves around the class and approaches groups to see if they need help or assistance. At the conclusion of the activity, the instructor returns to the front of the classroom and chooses a team from the stack of 3” x 5” note cards and calls upon this team to report their answers to the entire class.

During the group report phase of the ACT UP, the instructor asks specific and directed questions about how the group came to their answers. During our ACT UP #1, the students are very confident in their answers to the first two images, the transverse and coronal MRI sections, but they are always completely baffled by the colored cryosection of the feet. Their confusion can be cleared by showing a web-based animated “fly-through” of the Visible Human Male cryosections created by the University of Maryland (www.nlm.nih.gov/research/visible/visible_gallery.html), which allows them to see the body in cross section as the video travels through the human body from head to foot. When the students recognize the feet in the video, a general roar of understanding emerges from the group and they are now able to use their new understanding to answer the questions. At the conclusion of the class period, the instructor gathers the ACT UP books in groups and grades simply by asking specific questions about how the group came to their answers.

I have designed ACT UPs for each of the anatomical systems and additional ACT UPs designed to address challenging topics that our students struggle with during the semester, or topics that apply to current research or medical ethics. Some of these ACT UPs are summarized in Table 2.

Outcomes and Discussion

Devoting a limited, yet important, amount of lecture time to these activities has allowed me to assess quickly what students know, any limitations or problems they may have, and whether they can apply their knowledge to new scenarios. By interacting with the students during the lecture period, I can identify those students who need extra help, help them during class, and encourage them to come visit with me during my office hours. In addition, when the students are confused by an activity in one of the ACT UP, I am able to collaborate with them to identify steps we can take to solve the problem. In this situation, I am supporting and working
with them to develop problem-solving skills that they will need as they progress through their academic education and enter various health-care fields.

ACT UP allows me to integrate creative activities into what might otherwise be a traditional lecture. Within the framework of the ACT UP, I have provided a space within the class to challenge students’ understanding, ask them to apply their information, present new and novel topics that are not covered in the textbooks, and connect the course to other disciplines such as theology, philosophy, engineering, sociology, and psychology. Course content is not limited, but now enhanced by these activities. Grading their books is as simple as glancing through them and checking off their work. Because we go over the answers in class and they receive class credit for participating, student participation has been substantially elevated. If students are not participating, I can easily approach them during the ACT UP time and ask them why they are struggling or how I can help them proceed with the activity.

Survey results from the 2007-2008 academic year suggest that the ACT UPs are perceived as a beneficial addition to the curriculum. When asked about the class format (lecture + ACT UP), 92% preferred this class format to a more traditional lecture format. When asked whether or not they felt that the ACT UP helped them better understand how to apply and integrate the concepts we were learning, 92.5% agreed that the activities helped them accomplish this goal.

One additional, and unexpected, outcome from the implementation of the ACT UP appeared on our formal Department of Biology end-of-the-semester course evaluations. One of the items on this evaluation form asks students to respond to the following question, “What aspects of this course contributed most to your learning?” The most common response is usually along the lines of the teacher, the book, and the ever ubiquitous PowerPoint presentation. During the 2007-2008 academic year, however, students cited the ACT UPs as a potential contributing factor to their learning.

Table 2: ACT UP Examples for specific topics.

<table>
<thead>
<tr>
<th>ACT UP Name</th>
<th>General Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction of Anatomy</td>
<td>Images are taken from the Visual Human Project Students are asked to examine the images and answer questions that focus on understanding and applying their knowledge of anatomical regions, directional terminology, and organ systems.</td>
</tr>
<tr>
<td>Tissues</td>
<td>Images are taken from the HAPS Histology Database Students are asked to apply their knowledge of tissues to identify and name a given unknown tissue. Image of Leonardo da Vinci’s Vitruvian Man The image is labeled with arrows pointing to specific anatomical regions. Each arrow lists a type of tissue and students are asked to identify the structure that the arrow could be pointing to and whether or not the tissue label is correct.</td>
</tr>
<tr>
<td>Skeletal System</td>
<td>Images taken from Martini et al., 5th edition, Figure 5.2, The internal organization in representative bones All of the labels on the figure are removed and students are asked to create a table listing specific bone features and whether these features are present in both compact and spongy bone. Questions on a Power Point slide Students are presented with a series of questions in which they determine at which point in development they would expect osteoblast activity to outpace osteoclast activity and vice versa. Questions on a Power Point slide Case study of supraphysiological doses of estrogen in growing children. Students are asked to debate the implications of these treatments and how this pertains to the endocrine control of bone growth.</td>
</tr>
<tr>
<td>Autonomic Nervous System</td>
<td>Questions on a Power Point slide Students are presented with four organs and each group is responsible for determining the path that the autonomic nervous system would take from the spinal cord to the given organ. The organs include the heart, the arrector pili muscle, the adrenal gland, and the liver. Image from Walter Cannon’s “Wisdom of the Body” The image used depicts a cat undergoing environmental cooling, which results in piloerection occurring on only one side of the cat. The students use their anatomical knowledge to determine the research methods Walter Cannon used to create this cat.</td>
</tr>
</tbody>
</table>

References
The nursing profession has come a long way since the 1880’s when Florence Nightingale instructed her nurses to sweep and mop the floor of the ward daily, make sure a scuttle of coal was available to maintain the proper room temperature, and wash the windows of the ward once a week. In those days nurses were expected to work a twelve to thirteen hour day; attend regular church services; and abstain from tobacco, liquor, dance halls, and the hairdresser. Nursing was a difficult, labor-intensive job completely devoid of status, accolades, or significant financial reward. Nurses were not expected to express personal opinions or engage in independent thought. Today, nurses are active participants in health care. They are trained to think critically and to problem-solve. Science-based independent thinking is encouraged, assertive communication skills are fostered, and professionalism is a primary goal of their training.

Many of the changes in the nursing profession have come about as a result of changes in technology. The nation’s nearly three million nurses comprise the largest health care force in the United States. Trained nurses are found across the health care spectrum, providing patient care at every stage of life. They form the largest component of any hospital staff, serve as the primary provider of patient care in hospital settings, and deliver almost all of the long-term care that is provided to the elderly. Today’s nurses must be as comfortable with new technology as they are with managing patient care and starting IV’s. Many nursing specialties such as nursing informatics, forensic nursing, and research nursing are technology dependent and did not even exist a decade ago.

Technology is incorporated into a nurse’s environment at all levels. Electronic Health Records (EHR) and computerized patient documentation have made it easier for nurses to assess a patient’s status and needs. Patient monitoring systems have taken much of the guesswork out of patient evaluation. “Smart” IV pump technology ensures that the proper dosage of medicine is maintained throughout a course of treatment. Ergonomic equipment has made lifting and transferring devices safer and pain-free for both nurses and patients and access to databases run by nursing experts has made it a great deal easier for nurses to obtain and evaluate information.

Point-of-care technology makes it possible for nurses, using wireless computer technology, to access patient records, view x-rays, receive medication information and even obtain a second opinion, all right from the patient’s bedside. Bar codes, wristbands, and radio frequency identification (RFID) make it easier to track patients while palm scanning, eye scans, and microchips make it possible to quickly identify both patients and staff. Currently in use in Japan in the financial industry, a new system known as “Palm Secure” establishes a person’s identity by reading the vein pattern in their palm when the palm is passed over a light box. This system, though not yet in widespread use in hospitals in the US, could help to eliminate duplication of medical records and save enormous amounts of time that would otherwise be spent assessing patient information. Another innovation known as the “Aware Gateway” system downloads a patient’s vital signs directly from his or her bedside monitor to the hospital information system where the information is immediately available to physicians, either in their office or via a hand-held device, when the physician is making rounds in the hospital or at home. Physicians can then respond quickly as a situation unfolds and nurses are freed from time-consuming data entry requirements so they can spend more time with their patients.

Technology has also made it easier for the elderly to remain safely in their own homes for longer than ever before. Elderly individuals can now be monitored remotely using a variety of sensors and non-invasive monitoring techniques that are installed at given locations throughout the home. Human activity such as walking, bending, or falling can be tracked using these monitoring systems and most astounding of all, remote brain imaging technology can correlate brain changes with behavioral patterns as a patient’s condition is evolving.

Advances in technology over the years have increased patient satisfaction and improved both patient and employee safety. Even Google has gotten into health care technology arena with its Flu Tracking tool that predicts the number of flu cases in a given area by tracking Google searches for flu-related topics. However, in spite of all the new technology that has become available to nurses.
and hospitals, the shortage of nurses that began in the 1990’s is still evident today. As the baby boomer generation ages, a two-fold problem has emerged. The baby boomers will require extensive nursing as they continue to age at the same time that the largest group of nurses, baby boomers themselves, is on the brink of retirement. It is estimated that by the year 2016 more than one million nurses will be needed to fill vacant spots in the nursing community. The current shortage of nurses increases the nurse to patient ratio and increases the mandatory overtime hours a nurse is required to work per week. The result can be an increase in medication errors and an increase in the difficulties fatigue and stress can bring to bear on nurses.

Several studies suggest that there is a link between medical error and the stress and strain of the current nursing shortage. According to the Institute of Medicine (IOM), an independent organization that is chartered by congress, medical error is defined as “the failure to complete a planned action as intended or the use of a wrong plan to achieve an aim.” The Institute of Medicine reports that there may be as many as 98,000 patients who die in hospitals on a yearly basis as a result of medical error. In fact, in 1999, medical error was the eighth leading cause of death in the US taking more lives annually than “motor vehicle accidents, breast cancer or AIDS.” While technology has improved health care delivery immeasurably, there are some who are concerned that technology, particularly when it is poorly understood or poorly implemented, may play a role in the involvement of nurses in medical error.

At the forefront of the movement to reduce medical error is the Leapfrog Group, a conglomeration of non-healthcare Fortune 500 companies whose main objective is to modernize the health care industry. The Leapfrog Group’s research has pinpointed three evidence-based standards that they believe would have the greatest impact on reducing medical error: 1) computerized physician order entry systems (CPOE), 2) evidence-based hospital referral (EHR), and 3) intensive care unit physician staffing (IPS). In the wake of perhaps as many as one million medication-related errors in hospitals each year that result in approximately 7,000 deaths, computerized physician order entry systems that link medical staff such as nurses, therapists, and pharmacists or departments such as the laboratory or radiology, are being instituted to automate the ordering of medication by ensuring standardized, legible, and complete orders. Most computerized, physician-order entry systems are made to interact with clinical decision support systems (CDSS) that provide different degrees of error prevention, depending on the system. The software that powers these systems often contains prescribing information or cross-referencing of laboratory and allergy information which makes it possible not only to have accuracy in filling prescriptions, but also to do away with redundant diagnostic testing. The current estimate is that the implementation of computerized physician order entry systems could save the health care industry more than $500 million annually. When used in conjunction with available clinical pathways, it has been demonstrated that computerized physician order entry systems effectively reduce in-hospital costs and length of patient stay.

The main drawback to implementing a computerized physician order entry system is cost so these systems are not yet widely used in hospitals in this country. Some critics point out that staff inexperience with the system can actually cause slower order entry and physician to nurse communication can worsen if each group feels isolated at their workstation. Automation of this type can also result in a false sense of security and may ultimately increase adverse events if people become careless, believing that technology is in control of everything. Computer glitches and downtime, default selections, warnings and alerts can all complicate computer systems. When implemented on a large scale, it will be imperative that nurses understand these order entry systems and become full partners with their colleagues in the medical and pharmaceutical communities in the quest to save both lives and money.

Evidence-based hospital referral (EHR) is a means of guiding elective admissions to the hospitals that have the most experienced physicians and nurses for a particular ailment. If patients went to the best treatment facilities for elective procedures such as coronary artery by-pass surgery, angioplasty and carotid endarterectomy, instead of choosing hospitals on the basis of geographic proximity, the estimated savings are projected to be 4,000 lives and four billion dollars annually. The downside to evidence-based referral is the possibility of unnecessarily performed procedures, decreased competition and decreased consumer choice. The details of evidence-based hospital referral plans are difficult to work out but in the light of projected savings in lives and money continued research is sure to center on this alternative.

With mortality rates as high as 20% in intensive care units (ICU), the Leapfrog Group is also looking closely at ICU Physician Staffing (IPS). Intensive care units typically account for 30% of acute care expenditures and cost $60 billion to run annually. A 20% mortality rate in ICUs equates to approximately 500,000 patient deaths each year. Estimates are that better staffing and increased usage of technology in specially chosen ICU’s could reduce mortality by 15% to 60% and save 50,000 lives and $5 billion annually. The downside to centralizing ICUs would potentially be to put smaller community based hospitals, those that could not...
support an intensive ICU model, out of business. ICU physician staffing proposals are controversial and many consumers are not comfortable with seeking medical care away from their family, community, and primary care giver. Implementation of ICU physician staffing standards would also displace many nurses and force them to relocate closer to large urban centers where treatment can be dispensed more cost effectively.3

Clearly there will be many challenges facing the health care practitioners of the future. Nurses, like other health care providers, will need to explore initiatives to improve the quality of care they deliver to their patients. In the midst of the technology boom in hospitals across the nation at least one thing is certain -- nurses will be there in larger than ever numbers and they will continue to be both dedicated to their patients and motivated to do the best job possible in a wide variety of health care settings. The most important technological skill the 21st century nurse will have is likely to be the ability to adapt to the obsolescence of old technology and the willingness to master new technology quickly and efficiently.13 The nurses of the 21st century will have boundless opportunity to participate in health care delivery in a highly technical age but they will be touching people’s lives and hearts every day as they have since the time of Florence Nightingale and they are certain to remain as compassionate and caring as they have always been.

* Sarah Ritter graduated from Arcadia University in December of 2009 with an individualized major in Health Sciences. Excerpts from her Senior Thesis “The Changing Environment for Nurses: Sources of Medical Error and Methods of Prevention” appear in this article.

References
Is Evolution as Important as We Think?

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“Nothing in biology makes sense except in the light of evolution.”
Theodosius Dobzhansky, 1973

Like many HAPS members, I teach both general biology and human anatomy & physiology. As a biologist, I use the concepts of evolution to make sense of everything from heart valves to bird migration, and, as an instructor, Darwin’s ideas have been the foundation of my general biology courses. For those of us who teach general biology day after day, and even year after year, evolution is indeed the core concept. But in human anatomy & physiology I mention Darwin maybe once a week. Is this normal? Should Darwinian evolution be a topic in human anatomy and physiology? Is Darwin’s theory as important to, for example, physiologists and medical doctors as it is to freshman biology educators? Two experiences this past January made me think critically about the place of evolution in our biology curriculum: the first was a three-day symposium to create a new series of non-majors biology courses, and the second, an advanced cardiophysiology course offered within the Academic Health Center at the University of Minnesota (U of M).

The U of M’s College of Biological Sciences is currently making efforts to redesign their non-majors courses. During the first week of January I joined fifteen other biology educators for a three-day retreat to create new learning outcomes and lab activities for future economists, engineers, journalists, etc. Just prior to the retreat a letter appeared in the local Minneapolis newspaper from a medical doctor who was warning of the evils of evolution and the virtues of creationism. “How could medical doctor be a creationist?” and “How could a person go that far in biology and not see evolution?” were two common topics at the beginning of our retreat. From our perspective Dobzhansky was spot-on when he wrote in The American Biology Teacher “Nothing in biology makes sense except in the light of evolution.”

Over the next couple of days we made progress toward designing three new courses. One of the unique features of our curriculum design was that we agreed that even though the students could be in one of the three different courses, all students could engage in the same series of lab activities if they focused on the theme of evolution and the nature of science. No matter what we taught in lecture, be it the biology of genetically modified organisms or human reproductive innovations, teaching evolution and the nature of science in the lab could be easily justified; every learning outcome we developed could be easily linked to biological evolution. I came away from that first week in January thinking that the future students in the new courses were in good shape; if they had a firm foundation in evolutionary theory they could indeed understand quite a bit of our natural world.

During the second week in January I was enrolled in an advanced cardiophysiology course offered by the U of M’s Academic Health Center. The course was taught by a collection of professors and medical doctors who had world-wide reputations as experts in areas such as echocardiography, signal transduction, and cardiopulmonary resuscitation. The course enrolled many biomedical engineers from local medical technology companies who were there to learn about new developments in cardiac surgery, pacing, etc. The course met for five days. Each day included five or six presentations and a couple hours of lab activities. As a person who specializes in freshman biology education I listened to each presentation with the question “where is evolution?” foremost in my mind. Almost every presentation involved physics, biochemistry, and cell biology; but, where was evolution? One presenter did spend a couple minutes on the dangers of teleological thinking – a topic that interested me, but undoubtedly caused many engineers to drift off.

The course made me reconsider Dobzhansky’s statement and the importance of Darwin’s ideas. How important was an understanding of biological evolution to this collection of experts in cardiophysiology? To answer the question I sent a one-question e-mail survey to each of the 22 presenters in the course. The survey questions asked:

In a typical freshman biology course there are 6 major topics. Please rank the following from 1 (most important) to 6 (least important) in terms of relevance to your current research in human physiology.

___ Biochemistry / Molecular biology
___ Cell biology
___ Genetics
___ Ecology
___ Evolution
___ Survey of the kingdoms (plants, animals, fungi, etc.)

Five days after sending the initial e-mail, 17 of the 22 presenters had responded to the survey. Results (Table 1) showed that biochemistry/molecular biology and cell biology were by far the most influential topics for the physiologists. Evolution had a modal response of fourth; its highest rating was third and its lowest was sixth. (It should be noted that some responses to the survey had multiple items ranked in first place or last (sixth) place.)
Data from the survey clearly indicated that the topic of evolution was not as important as biochemistry and cell biology in terms of relevance to the cardiophysiologist’s current research. Should this result be a surprise to biology educators? No. Medical professionals typically do not care about the evolutionary history of the Thebesian valve or other adaptations within the cardiovascular system. What they do care about is health care – understanding regular and irregular physiology and devising interventions to help people overcome disease. And in this light, biochemistry and cell biology are more immediate to the health and survival of a human than the big picture view provided by Darwin’s theory of evolution by natural selection. Furthermore, it should not be surprising to see an occasional creationist letter to the editor from a medical professional. Unlike those of us who teach freshman biology, they do not have to see evolution as the driving force in nature to be effective professionals. And to push the point a bit further, after 5 intense days of seeing firsthand the incredibly complex anatomy and physiology of the heart, I can appreciate both the theology of William Paley and the science of Charles Darwin.

I still think Dobzhansky was right, and that we should continue unapologetically to teach Darwin’s theory of evolution by natural selection to all biology students. For me it remains the best way to describe, explain, and even predict biological events. But I have also become more aware of how a highly-educated medical doctor might disagree with Dobzhansky and rather view life through the lens of creationism.

If you wish to respond to this article, go to http://blog.lib.umn.edu/msjensen/haps/

**References**


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**Table 1. Survey results.**

<table>
<thead>
<tr>
<th>Topic</th>
<th>Mode</th>
<th>Highest ranking*</th>
<th>Lowest ranking*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemistry/Molecular biology</td>
<td>1</td>
<td>1 (10)</td>
<td>2 (6)</td>
</tr>
<tr>
<td>Cell biology</td>
<td>2</td>
<td>1 (7)</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Genetics</td>
<td>3</td>
<td>1 (1)</td>
<td>4 (3)</td>
</tr>
<tr>
<td>Ecology</td>
<td>5</td>
<td>4 (1)</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Evolution</td>
<td>4</td>
<td>3 (4)</td>
<td>6 (3)</td>
</tr>
<tr>
<td>Survey of the kingdoms (plants, animals, fungi)</td>
<td>6</td>
<td>4 (2)</td>
<td>6 (11)</td>
</tr>
</tbody>
</table>

*The number in parentheses represents the number of respondents giving this ranking for the topic.

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**Editor’s note:** Periodically there is a flurry of email activity on the hapslist about various books of interest to Hapsters: books that could be used in the classroom; books that help us as educators; books on history or medicine; or books that are just a “good read” for anatomists, physiologists and biologists. With the reviews that follow, we begin a new column in the HAPSEDucator. We welcome your book reviews and look forward to hearing about a variety of ways to stimulate our students’ thinking, as well as our own, through the words of others. We are not seeking, and will not publish, any textbooks reviews here. This is just about the wealth of other books out there: both fiction and nonfiction.

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**The Lunar Men: Five Friends Whose Curiosity Changed the World**

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It is always interesting to look at history from another’s eyes and Ms. Uglow has an unusual perspective. The author has serious credentials as she has written several other books about British history in this time period. *The Lunar Men* ostensibly concerns itself with a learned society of British men who met frequently to discuss scientific, sociopolitical, and engineering advances. Various experiments also occurred during their meetings. Although these meetings are the primary focus of the book, in fact, the book examines much of English-speaking society during the mid-18th Century to the early 19th Century. Since several of the members of the Lunar Society were physicians and one was a famous chemist, the book has relevance to the historical development of anatomy and physiology. Therefore, some HAPS-Ed readers may find it a useful source of information for their classes.

The author places the major characters within their historical contexts and shows how they influenced, and were influenced by, significant events of their day -- the American and French revolutions, as well as the Industrial Revolution. The group met on days with full moons, hence the name, Lunar Society. It primarily included Josiah Wedgwood, Erasmus Darwin, Joseph Priestly, James Watt, and Matthew Bolton. In addition, there were seven less well-known regular members. Many others attended some of the meetings and played roles in their lives. The most familiar of these is Benjamin Franklin, friend and correspondent to several of the members. If you have never heard of the five principal members, here is a quick review of some of the things that place these people amongst the leading figures of their time. Josiah Wedgwood was the founder of the china and porcelain company that still bears his name. Erasmus Darwin is probably best known today as Charles Darwin’s grandfather (Wedgwood was another) but he was also the best physician and surgeon of his day as well as a famous early thinker in evolution. Priestly was one of the most illustrious early chemists, being the first to isolate oxygen, but in his own time he was prominent as a religious and political thinker, too. Bolton and Watt are best known these days as makers of the first modern steam engine.

Why would anatomy and physiology students be interested in reading this book? The work of Erasmus Darwin, in his role as a physician of his day, provides interesting historical context for the practice of medicine. Darwin received his medical education at Edinburgh University. That education included the “humoral” notion of disease, apparently first put forward by Empedocles of Agrigentum about 2400 years ago, but taken up more famously by Hippocrates and still practiced in the 19th Century. In this mindset, the various humors of the body (yellow bile, blood, ‘black bile,’ and phlegm) must be kept in balance. Hence, if a physician were to determine that there was too much blood, the doctor would proceed to bleed the patient. The remarkable thing is that this action could be at least temporarily effective sometimes - as in cases of polycythemia. However, the failures were many: George Washington was bled to death and even Erasmus Darwin bled one of his daughters excessively and ultimately fatally. On the other hand, Darwin was open-minded and, along with his lunar colleagues, was willing to experiment with almost anything. His
most successful remedies used common sense approaches. He was also willing to try out herbal therapies and maintained a huge garden of medicinal plants. You have heard of one of these, foxglove, from which we isolate digitoxin, still used today as a therapy for atrial fibrillation.

In some ways Joseph Priestly is a more interesting person since he certainly never attained the wealth and influence of Darwin. While he performed numerous experiments and ultimately discovered oxygen among other things, he was intellectually wedded to a paradigm called phlogiston. Phlogiston was supposed to be a material found in every combustible material that then left in the smoke. Priestly never could abandon this idea, though the idea was disproved, largely by the work of the French chemist Antoine Lavoisier. The latter then was able to show the roles of carbon dioxide, oxygen, and water in respiration. Lavoisier went on to provide many of the names of chemicals and gain the tributes due him in his time as well as ours. This should be a lesson to those of us who, like Priestly, just cannot give up on outdated and unworkable ideas. Unfortunately, both the Frenchman and the Englishman were swept up and ultimately destroyed by the revolutionary times: Lavoisier lost his head to the guillotine in 1794 for his support of the French monarchy; Priestly was driven into exile to Central Pennsylvania for his alleged opposition to the English monarchy!

There are some shortcomings in *The Lunar Men*. Much about pottery glazing, 18th Century canal building, British politics, and the intricacies of the steam engine may have little relevance to the more biologically-minded reader. I also found Uglow’s attention to the minutiae of some of the members lives tedious. For example, who cares now (or at any time in history) about the narcissistic Thomas Day’s attempts at mating? An inherent fault in any book about a small group of people is that the material will be unbalanced. For example, some of the information related to the Industrial Revolution emphasized the efforts of the Lunar Society members to the expense of other pioneers in the dawn of the Machine Age. Readers wishing a more comprehensive view of British history may find Niall Ferguson’s masterly *Empire* (2002, NY: Basic Books) more their cup of tea. Hal Hellman’s *Great Feuds in Science* (1998, NY: John Wiley & Sons, Inc.) provides an interesting approach to the history of science. Finally, there are many fine, but more technical, volumes on the Industrial Revolution but none so intimate.

This critically-acclaimed book is an easy read. With frequent excursions into the daily lives of the principal characters, one feels that he or she is a friend of Josiah Wedgwood, for example, and shares in his triumphs, frustrations, and personal tragedies. I would recommend this book to the anatomy and physiology professor or to the more advanced student interested in the history of science.
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