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Cover art: by Valerie J. Christell. She states, “I have a passion for expressing my response to world issues and making a difference in the world through the arts. This has resulted in various roles: (1) Founder/Director/Artist of Merge Gallery to create/present collaborative, social statement art installations to raise awareness; (2) Arts Writer for Third Coast Digest to analyze local and global art/issues; (3) Instructor at Alverno College to encourage others to learn about themselves and the world through an art lens; and (4) Consultant for arts organizations to assist their outreach efforts.” Thank you to HAPSter Pat Bowne for bringing Valerie and her art to the HAPSEDucator.
Greetings HAPSters!

It is with great pleasure that I continue the mission of HAPS as its 22nd President. As I begin my tenure, I wish to express my sincerest gratitude and thanks to John Waters for his outstanding leadership this past year and for making my transition as seamless (and painless) as possible!

I want to officially welcome the following new committee chairs: Valerie O’Loughlin – HAPS Foundation, Tom Lancraft – Web Editor, Elizabeth Penenefather-O’Brien – Membership co-chair (with Elizabeth Hodgson), and Nicholas Despo – Animal Use. In addition, I applaud those HAPS members who have given so freely to HAPS as they step down from their chair positions. Those folks include Judi Nath (HAPS Foundation) who was instrumental in establishing the Foundation and growing the funds to over $10,000 in less than a year, Carl Shuster (Web Editor), who has been our “go-to guy” for years for web and technology issues, and Don Kelly (Animal Use) who has relinquished his role as chair of Animal Use only to take on the three-year commitment as our new President-Elect.

The Board, with considerable input from the Steering Committee (composed of HAPS committee chairs) and Executive Director Larry Spraggs, has developed a five-year strategic plan that was officially adopted at our June Board meeting. The adopted plan, which will act to provide this and future Boards with direction, consists of six strategic initiatives: 1) expand the professional outreach of HAPS, 2) enhance conference programming, 3) expand HAPS-I, 4) increase alternative revenues for HAPS, 5) review HAPS-ED publication efficacy, and 6) review HAPS governance structure. Within each of these initiatives we have developed specific action steps that are going to involve a tremendous amount of work from the Board and many of our committees. The entire Strategic Plan will be posted soon on the HAPS web site. We are excited to initiate our work on this plan and welcome comments from HAPS members.

Our new Web Editor, Tom Lancraft, has taken the lead on discussions concerning changes in our web site. Although major changes are cost prohibitive at this time, there will soon be some changes in the navigational buttons, providing visitors a more manageable and intuitive navigation of our web site. Many thanks to Tom for leading this discussion and having the expertise to make it happen!

For those HAPSters who are already dreading the inevitable snow and cold of winter, we invite you to escape by attending a HAPS Regional Conference in Sarasota, Florida, January 22, 2011. For those who are fortunate enough to live in the “sunnier” climes of the south, this Regional Conference is a perfect opportunity to interact with your colleagues – locally and from afar! Thanks to Jeff Laborda for coordinating this conference. We would like to see more regional conferences throughout the U.S. If you would like to help coordinate one, please contact Ewa Gorski our Regional Conference Committee Chair (egorski@ccbcmd.edu).

Also, begin planning ahead for our 25th Annual Conference in Victoria, British Columbia, Canada. From viewing the presentation given in Denver by conference coordinator Peggy Hunter, this conference promises to be “the best one yet!” As a reminder…..you WILL need a passport for passage back into the U.S. (unless, of course, you decide that Canada is just too beautiful to leave!). Keep checking our website for updates on the conference.

I look forward to a productive and busy year as your HAPS President. Please do not hesitate to contact me, your Regional Director, or any Board member with ideas or concerns.

Caryl Tickner
President, Human Anatomy and Physiology Society
tickner@starkstate.edu; 330-494-6170 ext. 4915
Visible Body revolutionizes anatomy education. You are in control of this highly detailed 3D model. Use on-screen controls to rotate, isolate, and zoom. Visualize 2,400 structures from any angle.

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I’ve been the Executive Director of HAPS for over 6 months now and I continue to marvel at the vitality of the organization. I have found the organization extremely complex. The fact that HAPS was run by volunteers for so many years is a testimony to the dedication of so many members. This dedication persists, making my work very satisfying and productive.

I have begun to provide support to our new President, Caryl Tickner who has embraced the Strategic Initiatives in her work to create the desired future for HAPS. The Strategic Initiatives (please review the plan on the Governance page of the HAPS website) give the organization goals and action steps to take over the next five years. The role of volunteers is as important as ever to achieve our goals, but now there is also the assistance of a full-time executive director to provide day to day oversight of organizational activities. While my focus will be on member services, and how these can be enhanced in the most economical way, I stand ready to work with all the committees in their efforts.

One of the activities that I have been working on with the Board of Directors is the “branding” of HAPS. A brand for an organization reaches out with an emotional connection between the members and the organization. The branding exercise we have been undertaking has elicited very strong emotions about how HAPS has affected members. Again, this speaks to the vitality of HAPS as it enters a new era.

After we agree on the HAPS “brand” we will be able to complete many initiatives that are underway, like a total refresh of the HAPS Website, a marketing plan for the organization, a membership drive, and a HAPS Foundation fund drive. All members will be kept aware as these projects come to fruition.

I hope you all are happily back in the classroom promoting, as our Mission Statement says, “...excellence in the teaching of anatomy and physiology.” Have a great semester!

Sincerely,
Larry

Dr. Laurence Spraggs
Executive Director
Human Anatomy and Physiology Society

lspraggs@hapsweb.org
HAPS in Review:
Summary of the Update Seminar # 5:
The Visible Human Revisited -- Anatomical Visualization and Medical Procedure Simulation

Speaker: Victor Spitzer, Ph.D.
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Dr. Victor Spitzer introduced his seminar with a short history of the Visible Human Project, sponsored by the National Library of Medicine, beginning with his own involvement at the University of Colorado where the first data set was generated with a male and a female cadaver acquired in 1993 and 1994, respectively. At that time, the work was evidently difficult due to the lack of space large enough to both store and work on the specimens – especially during hot summer months. Thus, it was a huge improvement when the team acquired space in the old Fitzsimmons Army Medical Center, adapting the cafeteria to meet their needs. The UC Denver’s constrained spaces were replaced by a building that offered 12,000 square feet, including a spacious morgue and a walk-in freezer. This afforded Dr. Spitzer and his team the ability to maintain the cadaver at the correct temperature during the slicing process as well as during storage.

The Visible Human Project has facilitated the “reverse engineering” (“put it back together”) of the human body where one can visualize the anatomical features in any number of ways. Although the original concept of the Visible Human Project was to generate photographic data from slices of cadavers, it has evolved into something far more ambitious. From 1989 through 1991 this project was driven by educational and training needs as well as by the need for quantitative modeling of human anatomy. Such a data set would form an interface between measurable and qualitatively visual information, thus providing a universal reference standard for the study of human anatomy. The project brought together people from diverse scientific and entertainment communities. (I suppose, in retrospect, that it does make sense why someone from the upper management at Pixar Animation Studios would have been included on the Board.)

The efficacy and usefulness of the whole project was dependent on the resolution, and the best that CT or MRI images of the day could offer was 1mm. From the outset it was decided that the acceptable donated body would be no more than 60 years of age and would have had no surgeries. Consequently, about two years would pass before an acceptable cadaver for this project would be found. A panel of specialists chose the best of the three male and three female specimens that were donated. Currently, 3 Korean and 6 Chinese cadavers are also being recorded.

Prior to Dr. Spitzer’s involvement in the project, cadavers had been sliced with a band saw; researchers had been successful in producing slices down to a thickness of 3mm. While the anatomists were more interested in “slicing” the specimen (and preserving the slices for posterity), Dr. Spitzer’s background as a physicist offered a very different perspective on the objective. He was interested in recording the outcome in a series of pictures. He explained it quite lucidly as exposing the patterns in wood by grinding, where one is not interested in the saw dust, but rather in what is visible on the surface of the wood.

One of the first slides Dr. Spitzer showed his audience at the seminar was that of the layer “4107” – the 4th slice at 107mm from the surface. The transverse plane showed sinus cavities containing the blue gelatin that was used to fill the body cavities. This gelatin prevented the rapid thawing of the specimen as it was being cut and also prevented exposure of the layer beneath the level that was being photographed. CT and MRI scans were performed several times prior to each episode of slicing and grinding. The entire process was quite painstakingly repetitive. The male body took 4 months to complete, while the work on the female body took a year. The transverse images were stacked up and frontal and sagittal views were reconstructed digitally by Pixar. Certain images, like those of different types of blood vessels or nerves against ligaments or fatty layers, required that the images be produced with higher resolution since the traditional contrast staining would not have worked in frozen specimens. Polygonal models were reconstructed from these high resolution images.

(Continued on next page)
From the late 1990’s to 2000, grants were obtained to help perfect the techniques used for the Visible Human Project. Injections of contrast stains were tried, but there were leaks into the abdomen due to the gallbladder. Ultraviolet, infrared, and a wide range of spectral analyses (400 nm to 1000 nm) show promise in identifying tissue-specific signatures, but imaging techniques for this kind of visualization are not yet available. Spectral imaging of this kind, from a point source, has been tried on live dog tissue (nerves, muscles, pancreas, etc.). Although the technique has afforded a higher resolution on different tissues, it does not provide the bulk of the data. Currently, the specimens can be cut continuously (24/7) with the specimen surface being automatically frozen to -10°C, and sprayed with alcohol (to minimize frosting of surfaces) between subsequent cuts. The images captured are now automatically transferred and archived. The other projects that have been completed include a 5000-slice imaging of the foot and ankle that took 10 days to complete; a 100 µm, 2000-slice image of the knee; and a 50 µm, 800-slice image of the prostate gland. A visible chicken project has been completed with 2000 slices at 100 µ resolution.

Interesting side projects are producing useful information that is easily integrated with the Visible Human Project. Data from 24-week-old fetal slices enables the analysis of the torsion of the femur, as it rotates from fetal to adult stages, by comparing it to a femur of a 39-year-old individual. Undoubtedly, there is a substantial degree of interpolation involved here, but it does present us with very interesting possibilities in visualizing developmental changes. Isolated arteries, with high contrast latex injection, are being sliced and imaged at 100 nm resolution. The data thus obtained can be overlaid on the data for the named arteries from the whole body.

What other immediate benefits can we expect from this collaborative project? As outlined through a catchy video with equally appropriate theme music from the movie Star Wars, the possibilities are endless. Medical students are already trying the optic and dental simulators for surgical practice. The virtual arthroscopic manipulation at the conclusion of the seminar demonstrated how the Visible Human Project has evolved beyond the “visualization” of the human anatomy to a stage where the student is able to get the “feel” of a real procedure on a human body, complete with the resistance one encounters while pushing a needle through different tissue types. In the Visible Human Journal of Endoscopy, gastroenterologists can report findings with links to the Visible Human Database (University of Colorado Health Sciences Center). The Visible Human Dissector and atlas provide lessons in surface palpation through simulations. These advances point toward a time when our students will routinely have access to a virtual dissection of a virtual cadaver. Besides the obvious impact on student learning, this data is also likely to be used in the entertainment industry and in the commercial development of medical and health-care related products.

Note: Thanks to Julie Fickas, St. Louis Community College, for help with note-taking during Dr. Spitzer’s talk.

College professors agree that one of the most important life skills, which should be developed and refined during the college years, is writing. Most science professors are also of the opinion that the writing students do in humanities courses is not equivalent to writing in science courses. Why, then, are writing assignments so rarely seen in lower level science courses?

One of the key reasons for this discrepancy between the belief that writing is important and the lack of writing assignments is the time it takes to critically grade and provide quality feedback for writing assignments. Lower-level science courses also tend to have high enrollment, which makes them more of a challenge to faculty in terms of the workload associated with written assignments. Furthermore, many instructors, like myself, may have tried giving writing assignments only to find the time spent carefully crafting feedback should have been spent elsewhere, since the feedback was either not read or ignored, based on subsequent student submissions.

How, then, can instructors give students the writing practice that they need and still have time for other commitments? The answer for my courses, even my Anatomy and Physiology course, has been “CPR” or “calibrated peer review.” CPR is a free-software developed through funding by the National Science...
Foundation and the Howard Hughes Medical Institute for the purpose of managing writing assignments. All that the student and the instructor need to use CPR is an Internet connection and a current web browser. This technology-based teaching tool is level-independent and discipline-independent. Additionally, unlike most writing assignments, an assignment given in CPR works best in courses that have a high enrollment. This feature makes it particularly suitable for use in large, lower-level science courses.

Four steps are involved for the student to complete a CPR assignment. The student completes a written assignment according to his or her instructor’s directions. The student must 1) submit the assignment to the CPR web site, 2) review three different assignments submitted by the instructor (calibration), 3) anonymously peer-review three other students’ assignments, and 4) self-review his or her own assignment. If you are skeptical of student-graded assignments, I understand, because I once had the same concerns. Students all give each other A’s, right? This is not what I have encountered with CPR. CPR has built-in controls for the review process, and, as a result, I have observed that my students peer-review each other’s assignments with equal or even greater stringency than I would grade their assignments. Guiding questions provided by the instructor lead the students through the peer review process.

Creating the assignment

In creating a CPR assignment, there is an up-front time commitment by the instructor. This is a one-time cost, however. About three to five hours may be required to develop the assignment online, but after this initial time investment, little time is required to monitor students’ progress and completion.

Just as with any student assignment, the instructor needs to establish the goals of the assignment, provide resources for the student to read (in the form of references, articles, or web-links), set the grading criteria, and establish due dates. An additional component to setting up a CPR assignment is that the instructor needs to provide three essays that represent, in the instructor’s opinion, a good student essay, a poor student essay, and an average student essay. Some instructors decide to write their own essays, but I like to collect actual student essays the semester before I set up an online CPR assignment. I pick those student assignments that are representative of a good, an average, and a poor essay, sometimes modifying them to better suit the category in which they have been placed. These essays, referred to as “calibration essays,” are used to prepare the student for the peer-review process.

Students submit their assignments

The first time I ask my students to do a CPR assignment, I give the students a hard copy of the assignment, including the goals of the assignment, the due date, resources that I would like them to use, the appropriate length, and where to submit the assignment. Assignments are completed as Word documents. Then I have them submit the document (cut and paste) to the CPR website and a plagiarism detection service used by my institution. I set up a class on the CPR website using my students’ college ID numbers, which they subsequently use to access the site. They are provided with a user name and asked to set a password. Students are required to login to CPR to access future assignments.

Calibration and peer-review

Once all students have submitted their essays by the due date, they are asked to return to the CPR website to start the peer-review process. They are first provided access to the calibration essays in a random order. The students have to read each calibration essay and answer questions that are directed toward either the style or content of the essay. Usually I will ask them around ten questions -- questions that I would normally use in evaluating a student essay. I ask a few style questions related to grammatical errors, main ideas, and the flow of the essay. I also ask direct questions about content and whether the objectives of the assignment were met.

Students are then asked to rank the calibration essay on a scale from one to ten. Students who answer the evaluation questions as their instructor would, and match the essay to a similar rank as the instructor, may go on to the next essay. Students who fail to evaluate the essay appropriately are required to try again. The instructor can set how many questions must be answered correctly and can set a range of acceptable values for ranking the essay. Upon the completion of the calibration essays, students are given a score called the “RCI” or “reviewer competency index.” This score will be used to calculate a portion of the student’s grade for the assignment; it will also be used to determine the weight of their evaluation on other students’ essays. A student with a high “RCI” would, therefore, have a greater influence on the evaluation score of other students compared to a student who received a low “RCI.” This reviewer competency index only follows students through one assignment; they have the opportunity to improve their “RCI” on the next CPR assignment. Students who have an ability to discern good writing from poor writing, as determined by the instructor, have the greatest influence on the evaluation of other students.
After completing the calibration essays, students are automatically randomly assigned three student essays to peer-review. This is an anonymous process; neither the peer reviewer nor the student is given the identity of the other party. In the peer review, students are asked the same evaluation questions that they answered for the calibration essays, and they are asked again to rank the essay. A portion of the student’s score for the assignment is based on the weighted average of the three peer reviewers. A portion of the student’s grade is also determined for each peer review; for each review, the student evaluator must come within (an instructor-determined) range of the other peer reviewers. In large classes, it is more difficult for students to identify each other by writing style, which is one of the reasons this technology works best in a class with a large enrollment.

As a final step for the assignment, students are required to go back to their own essays and perform self-reviews, answering the same evaluation questions. A portion of their assignment scores are based on their own self-evaluation scores. In order to receive credit for this portion of the assignment, the student must match the weighted average that his or her peer reviewers assigned. For example, if a student gives himself an “8” on a scale of one to ten, and his peer review average was “4,” then the student would not receive credit. However, if the student evaluates his essay as a “4,” then full credit would be applied towards the assignment grade. This is the honesty factor. The instructor can adjust the settings such that a range of values is acceptable, for example, ± 1. In this case, a score of “3, 4, or 5” would then be acceptable for credit. Partial credit for a range of values can also be applied using the settings tool.

Therefore, students’ grades for CPR assignments are based on their ability to critically evaluate the calibration essays, their ability to evaluate other students’ essays, their critical evaluation of their own essay, and the overall quality of their own essay. The instructor can set the point value for each of these assignment components. The instructor can also set the “stringency” of the assignment, making the ranges for acceptable values either broad or narrow. I usually prefer to introduce students to CPR using less stringent settings, and I usually narrow the ranges as students become acquainted with the technology.

The CPR assignment library

Another great feature of CPR is the assignment library tool that can be accessed through the CPR website. Assignments can be saved to an instructor’s personal library to be used in future classes. Assignments can also be saved to an institution’s library to be used among multiple instructors at an institution. Instructors can also share their assignments on the CPR server library with instructors at other institutions. There are currently hundreds of assignments on the server library that instructors have created and shared, and most of these assignments are specifically for science courses.

The value of CPR writing assignments

Some of the benefits of using CPR for writing assignments are the same benefits that apply to traditional writing assignments. Writing engages the student with the course material. Writing promotes reflection and original thinking. Student’s communication skills and ability to express ideas are developed. Students also learn course material through writing. However, some of the benefits that are unique to CPR include 1) the repeated interaction that the student has with the course material through the CPR assignment, 2) exposure to the professional practice of peer review, an essential skill for the student in science to gain, 3) the development of critical self-review and autonomy, 4) for the instructor, the easy application of this tool in large lower level courses, and 5) the very minimal increase in faculty workload.

If you are interested in trying CPR for your Anatomy and Physiology course, check out the CPR home page at http://cpr.molscl.ucla.edu/ for further information and user’s guide for getting started.

* This information was presented by Donna Balding and Eric Sun as workshop 308 at the 2010 HAPS Annual Meeting in Denver.
Workshop 109:  
Development and Disease: Embryological “Stories” That Can Enhance an A & P Course

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For most of us, Anatomy and Physiology courses are already so content-rich that we cannot imagine adding yet another topic to the syllabus or expanding upon one that is already there. For example, time constraints leave little opportunity for detailed coverage of human embryology and, yet, knowledge of embryology can help greatly in understanding, appreciating, and assimilating details of anatomy. One approach to introducing students to embryology is to incorporate short, relevant, developmental “stories” into lectures in A & P. If the embryological stories can involve curious diseases, disorders, or defects, students are especially likely to enjoy and remember them. Ideally, the stories will not only teach some embryology but also help the students to better understand basic topics in A & P. This article summarizes a handful of developmental “stories”, each with a pathological correlation, that could be used to relate embryology to various topics taught in a typical Human A & P course.

Development of the Eye: Detached Retina

“A detached retina can result from a blow to the head or from some other trauma.” Many of our students might have heard this warning but may not know what a detached retina is. To understand this disorder, it is helpful to know how the eye, and specifically the retina, develops.

Development of the human eye is complex. Ectoderm from the surface of the embryonic head gives rise to the cornea and lens. Ectoderm of the forebrain (derived from the neural tube) gives rise to the optic vesicles which, in turn, form the retina and iris. Mesoderm between these two ectodermal layers contains many neural crest cells and these give rise to the fibrous and vascular coats of the eye.

The development of the retina from neural (brain) ectoderm provides some interesting correlates with anatomy and a disorder known as detached retina. The retina forms from two outpocketings of the embryonic forebrain, the optic vesicles. Over time, these vesicles become cup-shaped (optic cups) with the stalk of the cup remaining attached to the brain. Understanding the origin of the retina helps emphasize to students that the retina is composed largely from neurons. It is also important to note that because they form from optic vesicles, each optic cup has two layers that are separated by a small space. The more peripheral layer forms the pigmented layer of retina, while the inner layer forms the neural layers of retina. Although the space between these two embryonic layers disappears over time, there is never any real anatomical fusion between these layers. Because of this residual disconnection, the neural retina can easily pull away from the pigmented layer of the retina if, for example, there is a blow to the head. Students will have heard the term “detachment of the retina”; however, the retina, as a whole, never detaches from anything, but, rather, its two layers, derived from different layers of the optic cup, detach from each other.

Development of the Face: Cleft Palate

Cleft palate is, sadly, a fairly familiar anomaly of facial development. Organizations like “Project Smile” and “Smile Train” have disseminated photographs of children born with facial clefts, including cleft palate. Once again, embryology explains how such clefts can arise.

Development of the human face begins between the fourth and tenth weeks of embryonic development. The facial region at this time consists of a single frontonasal process, two maxillary processes, and two mandibular processes. The frontonasal process gives rise to the nasal placodes (precursors of the nasal canals) and to the small primary palate (the small portion near the upper lip). Most of the palate, however, develops from the paired maxillary processes, which are derivatives of the first pharyngeal arches. Beginning in the sixth week of development, the maxillary processes expand medially to form the palatine shelves. These palatine shelves continue to grow and eventually fuse to form a seam along the midline. In time, the seam degenerates, and the secondary palate is a continuous plate, filled with mesenchyme. Failure of the palatine shelves to grow or to fuse correctly can lead to cleft palate.

Development of the Reproductive System: Intersex Condition

“The moment a child is born... we ask whether the baby is a boy or a girl. It is a seemingly innocent question, but there is no more powerful way of...”
underlining the fact that sex is central to our understanding of who we are. How would we feel if that certainty were to be removed?" [http://www.channel4.com/health/microsites/H/health/magazine/sex/health_intersex.html]

This quote from an online news story sets the stage for a fascinating story about the reproductive system and the developmental pathways that lead to each of two patterns: male or female. Unlike any other organ system, the reproductive system develops with the potential for two different pathways. Initially, the gonads, ducts, and external genitalia all go through an "indifferent" or bi-potential stage, in which the structures are identical, regardless of whether the embryo is genetically male or female. At a critical point in development, some determining factor influences a particular organ to develop along either the male pattern or the female pattern. The indifferent stage, the developmental pattern, and the determining factor vary for each component of the reproductive system.

The gonads start out as the paired gonadal (genital) ridges, which have the capacity to develop into either testes or ovaries. If the embryo is genetically male, a region on the Y chromosome (SRY) codes for a product that causes the gonadal ridge to develop into a testis, with seminiferous tubules and with the ability to synthesize testosterone and AMH (anti-Mullerian hormone). In a female embryo, because there is no Y chromosome and therefore no SRY, the gonadal ridge differentiates into an ovary. In both developmental pathways, the actual gamete-forming cells (primordial germ cells) originate in the yolk sac and migrate into the gonadal ridge during the fifth and sixth weeks of development.

The reproductive ducts also go through an indifferent or bi-potential phase. Oddly, during this phase both males and females possess two pairs of ducts: during the fifth and six weeks, all embryos contain two mesonephric (Wolffian) ducts, as well as two paramesonephric (Mullerian) ducts. (The mesonephric ducts are the ducts of the second or "middle" kidney of mammalian development). The male pattern is determined by two products of the newly formed testis: testosterone and AMH. Testosterone influences the mesonephric ducts to develop into the male reproductive ducts (vas deferens, epididymus). AMH causes the paramesonephric ducts to degenerate. Female embryos, lacking testes, never produce these two hormones. Therefore, in females, the absence of testosterone causes the mesonephric ducts to degenerate, while the absence of AMH permits the paramesonephric ducts to develop into the female ducts (oviducts, uterus, part of the vagina).

To expectant parents, an obvious and intriguing aspect of reproductive development is the determination of the external genitalia. Up until the seventh week of development, the external genitalia are similar in both sexes and consist of a genital tubercle, paired labioscrotal swellings, and paired urogenital folds. Determination of the male pattern (into scrotum and penis) is once again driven by testosterone, or more specifically dihydrotestosterone. In females the indifferent genitalia develop into the female pattern (clitoris and labia) as a result of the absence of testosterone but also because of the influence of estrogen.

One clinical correlation that highlights the significance of human sex determination is the intersex condition (previously called "pseudohermaphroditism", a term that is now discouraged). It is important to handle this topic with great sensitivity, as many students seem unfamiliar with, or misinformed about, this condition. Discussion of this condition, however, provides many opportunities for students to review and apply what they have learned about human sex determination. For example, a page from the Intersex Society of North America website lists links to support groups for Androgen Insensitivity Syndrome and for Congenital Adrenal Hyperplasia (www.isna.org). Students find it intriguing to reason through why a male embryo that was insensitive to androgens (e.g. testosterone) could develop feminized or ambiguous genitalia. Likewise, if a female embryo had an overactive adrenal gland, the androgens produced by that adrenal gland could drive the indifferent genitalia to develop according to the male pattern.

**Neurulation and Neural Crest cells: Hirschsprung’s disease (congenital megacolon)**

Why might a newborn baby have problems with passing meconium or with obstructive constipation? If a barium enema shows a distended area in the distal portion of the colon, the child could have Hirschsprung’s disease. Hirschsprung’s disease, which occurs in 1/5000 live births, is a neurocristopathy, a disease of the neural crest cells.

Neural crest cells are special cells that arise from the neural tube during early development of the nervous system. These cells leave the tube, migrating out into the body, often over long distances, to settle in new locations. They then differentiate into a bewildering variety of cell types, including neurons of the cranial and autonomic ganglia, cartilage cells of the head, sensory neurons, cells of the adrenal medulla, and pigment cells. Neural crest cells that migrate into the gut become neurons ("ganglion cells") of the myenteric and submucosal autonomic ganglia. In Hirschsprung’s disease, neural crest cells that are supposed to innervate the wall of the gut fail to properly migrate, proliferate, and/or differentiate. Specifically, the defect results in a lack of innervation of the terminal part of the colon. The resulting lack of peristalsis in the diseased colon. The resulting lack of peristalsis in the diseased

(Continued on next page)
area of the colon causes distension of the area proximal to it. Fortunately, this problem can usually be corrected by a “pull-through” surgery in which the diseased area of the colon is removed and the healthy segments are reattached.

**Early Development: The role of cilia in infertility and situs inversus**

What possible link could there be in the symptoms shown by certain patients: respiratory problems, infertility (especially male), and situs inversus (reversed positioning of the asymmetric organs of the body)? The answer is found in the properties of cilia, and especially in a special type of cilia found in the early embryo.

There are two groups of cilia in the body. The better known type has a 9 + 2 configuration of microtubules, is always motile, and occurs in epithelia, such as those of the respiratory system and within sperm tails. A lesser known type of cilium is the so-called primary cilium. Primary cilia have a 9 + 0 pattern; that is, they have nine peripheral doublet microtubules, but they lack the central pair of microtubules. Primary cilia have been found in many cell types and often occur as a single cilium on these cells. The functions of primary cilia vary widely and are still being investigated. Primary cilia are usually non-motile; an exceptional case of motile primary cilium occurs in the very young embryo. These motile, embryonic primary cilia are called nodal cilia.

The role of both types of cilia in disease processes has become an area of active research. A fascinating disorder known as primary ciliary dyskinesia (PCD) was previously called immotile cilia syndrome. This term refers to a variety of disorders in which cilia are immotile, beat ineffectively, or do not form at all. Typical symptoms include respiratory problems, because of the essential role of ciliary beating in creating the flow of mucus that cleanses the air. Symptoms also include infertility, particularly in males, due to problems with sperm tail motility, but also an increased incidence of female infertility, probably because of motility problems in the cilia of the oviduct. The most puzzling symptom occurs in a special subset of PCD patients who present with all the above symptoms plus situs inversus.

PCD with situs inversus is known as Kartagener’s syndrome, and the triad of symptoms in these patients has led researchers to investigate whether cilia play a role in early embryonic development, specifically in establishing left-right sidedness.

Recent research has shown that in mammalian embryos left-right asymmetry (sidedness) first appears during the gastrulation stage. The links with PCD led researchers to look for cilia in these early embryos. Sure enough, studies show that in a small area in the ventral portion of Hensen’s node, at the cranial end of the primitive streak, some cells possess primary cilia. Intriguingly, these nodal cilia, while possessing the 9+0 configuration, are motile. The cilia, which contain dynein arms but no central microtubule pair, are capable of generating a swirling rotational motion that causes fluid to flow from right to left across the cells of the node. Two different models have been proposed for how this asymmetric flow could lead to left-right sidedness. The mechanical sensation model proposes that in addition to the motile primary cilia, the node possesses other cilia that can sense the fluid flow and respond to it by creating a signal in the cells on the right side of the embryo. In contrast, the chemical gradient model proposes that the flow created by the rotational movement of the cilia moves nodal vesicular parcels from right to left. Upon reaching the left side of the node, the parcels burst open, releasing morphogens that trigger calcium-mediated signaling on the left side only, and this in turn leads to asymmetric expression of certain genes. Regardless of how the signaling mechanism may work, the presence and motility of the nodal cilia provide a link between a systemic ciliary disorder that influences respiratory function and reproductive function and an embryonic event that establishes left-right sidedness.

**Summary**

These five stories provide just a few examples of how basic embryology can be introduced within the context of an A&P course. The pathological correlations appeal to students aiming for the health professions. I would suggest that in presenting these stories the provocative pathological correlation be presented first as a “hook” (as I have done in this article). I find that presenting the clinical correlation first captures the students’ attention and creates a “need to know” the basic biology that follows. Ideally, the stories will not only teach some embryology, but will also help the students to better understand and remember some basic topics in A & P.

**Selected references for further study**


Lee JL. 2009. Broken Symmetry: Scientists seek mechanisms explaining development of the body’s left-right pattern. Sci News 176:26


Primary Ciliary Dyskinesia Foundation. Website: http://www.pcdfoundation.org/aboutpcd/whatispcd.htm


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**Workshop 104, 504: Do Your Students Understand the anatomy of the Autonomic Nervous System?**

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**Concept**

Kinesthetic activities complementary to concepts presented in more traditional pedagogical methods (reading, lecture) engage students in the learning process and are more likely to increase their understanding and retention of knowledge. The ultimate goal of such activities is to improve the students’ understanding of what they have learned.

**Goals**

1. To stimulate creativity, student engagement, attainment of knowledge, and critical thinking using a hands-on, interactive activity that requires very simple, inexpensive materials easily obtained from craft and discount stores.
2. To improve student understanding of the anatomy of the autonomic nervous system through a collaborative, challenging, and kinesthetic activity.
3. To increase and improve student-instructor interactions; incorporate real-time, dialog-based assessment; and stimulate the development of in-class written (and/or online) pre- and post-activity assessments.

**Objectives**

Upon completion of this activity the student should be able to:

- Compare and contrast the anatomical components of the sympathetic and parasympathetic divisions of the autonomic nervous system.
- Trace the path of innervation from the CNS to the viscera by way of each of the autonomic pathways.

**Materials**

- Reference figures of the autonomic nervous system (e.g., in textbook, lab manual).
- Large sheets of paper (such as craft paper, unprinted newspaper, unprinted side of wrapping paper), green yarn, red yarn, adhesive tape, drawing instrument (pencil, for example), and scissors.

**Directions**

1. On a large sheet of paper, sketch an outline of a human body in anatomical position, except for the head, which should be sketched as a sagittal section (i.e., in profile).
2. Using green yarn for preganglionic fibers and red yarn for postganglionic fibers, illustrate sympathetic innervation of viscera in the head, thoracic cavity, and abdomino-pelvic cavity on one side of the body. Include at least one example of each of the sympathetic pathways: spinal nerve route, cephalic periarterial route, sympathetic nerve route (to thoracic viscera), splanchnic nerve route, and adrenal medulla. Identify the type of receptor found at each effector. On the same side of the body, sketch an enlarged section of the integument, including an apocrine and merocrine sweat gland, a hair with piloerector muscle, and adipose tissue. Use the adhesive tape to keep the yarn in place as the figure is developed.
3. Repeat step 2 for innervations via the parasympathetic division on the other side of the body. Include the nerve pathway of at least one structure innervated by each of the cranial nerves as well as structures innervated via S2 – S4.

(Continued on next page)
The following list includes organs that need to be sketched to complete the pathways. Effectors innervated by pathways developed as part of this activity should be listed on the diagram and sketched in the body that has been drawn.

- brain (include brainstem components)
- spinal cord
- cranial nerves III, VII, IX, and X
- pterygopalatine ganglion
- ciliary ganglion
- submandibular ganglion
- otic ganglion
- sacral nerves S2 – S4
- sympathetic chain with 3 cervical, 11 thoracic, 4 lumbar, and one coccygeal ganglia (connect chain to spinal cord by sketching appropriate spinal nerves)
- cardiac plexus
- pulmonary plexus
- celiac ganglion and plexus
- superior mesenteric ganglion and plexus
- interior mesenteric ganglion and plexus
- renal ganglion and plexus

Even though the students receive guidelines, part of the activity is to let them, as a group, manage how they will divide the steps to make the final project. An example of student work is presented in Figure 1.

**Assessment**

Assessment can be performed during the learning activity from direct observation of student progress in a real-time, question and answer format. Examples of questions that we routinely ask are:

- Is there any length difference between pre- and post-ganglionic fibers of the sympathetic and parasympathetic divisions?
- Which fibers are long in the sympathetic division? In the parasympathetic division? Which fiber(s) are short?
- Are you working with myelinated or unmyelinated fibers?
- Which neurotransmitter is released from each fiber? Which type of receptor is found at each effector?

This sequence allows students to have freedom in finding their own ways to develop critical thinking about building and analyzing the anatomy of the autonomic nervous system. Alternatively, pre- and post-activity written question and answer assessment may be used.

**Final Comments**

This learning activity can also be a social project for students in the classroom. We have experienced improved instructor-student interactions during this activity and have observed gratifying student-student interactions. This activity has been found to be an excellent ice-breaker as it is the first hands-on activity of the semester for students in the second semester human anatomy and physiology course. Finally, we have found that with all of the high-tech options currently being promoted for use in anatomy and physiology courses, this low-tech approach has received considerable approval from students and colleagues.

![Figure 1 – Final project of the parasympathetic division made by students. Spring 2010.](image)
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Imagine a disease that quietly and steadily overtakes you just when you thought it was safe to rejoice in having overcome so much in a long and productive life. Imagine a disease that seemingly strikes at random, respecting neither past good health nor a current active and healthy lifestyle. Imagine a disease that is 100% fatal whether you have excellent health care or none at all. Imagine a disease for which there is no known causative agent, virtually no effective treatments, and dim prospects for a cure in the foreseeable future. Imagine a disease that is more feared by the elderly than cancer or death itself because it robs them of dignity, personality, and joy while imposing a heavy burden on their loved ones. You are imagining Alzheimer’s disease and in this case imagination is indistinguishable from reality.

Alzheimer’s disease is the seventh leading cause of death in the United States. It is a progressive, neurodegenerative disease that destroys the underlying cells and tissues of the brain so that cell-to-cell communication eventually ceases to exist, undermining the physiological function necessary to carry out daily activities. Symptoms associated with the disease include memory loss that disrupts daily life, loss of cognitive abilities, and various types of behavioral and personality changes. Diagnosis of the disease involves mental status tests, a neurological exam, and a review of family medical history as well as Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET), and functional MRI (fMRI) exams. Taken together, these create a total picture of the disease including a detailed map of the anatomy of the brain and a measure of brain activity involved in cognitive tasks. Since 2004, a radioactive substance known as Pittsburgh Compound B (PiB) has been added to PET scans of Alzheimer’s patients because of its ability to bind to beta-amyloid in the brain. The addition of PiB allows doctors to measure the amount of beta-amyloid protein in the brain so that its concentration can be compared to the progression of external symptoms. These studies also provide evidence of the atrophied brain tissue and enlarged ventricles that generally characterize the diseased architecture of the brain. Following diagnosis, the disease typically runs its course in four to six years but in some cases it can progress for up to twenty years (Alzheimer’s Assoc. 2010; Klunk et al. 2004).

Several hypotheses have been proposed to explain the etiology of Alzheimer’s disease. Although a definitive cause has yet to be established, the most supported hypothesis is the amyloid cascade hypothesis that was proposed in the late 1980’s (Tanzi 2005). The amyloid cascade hypothesis proposes that Alzheimer’s disease is caused by the accumulation of globular structures known as beta-amyloid (Aβ) plaques. The term “cascade” is assigned to this hypothesis because the formation of amyloid plaques in the brain seems to trigger a cascade of events characterized by tau tangle phosphorylation, neuroinflammation and degeneration, structural distortion of neuron networks, synaptic destruction, and cell death (Pimplikar 2009). Normally, tau proteins function in stabilizing microtubules and structures of the cytoskeleton. Their abnormal tangled form can be observed in examination of diseased brain tissue in addition to the characteristic amyloid plaques, which are the hallmarks of Alzheimer’s disease. They become tangled through a series of C- and N- terminus phosphorylations in which tau is transformed into a paired helical filament. Paired filaments are then able to form aggregates that can be seen inside nerve cells and are believed to have the ability to induce neurotoxicity. Tau tangles first appear in the limbic system of the brain, which is made up of the amygdala, the hippocampus, and the hypothalamus. They move outward towards the cortex of the brain as the disease progresses causing microtubules in neurons and neuralgial cells to disintegrate, fatally disrupting cellular transport systems (Bulic et al. 2010).

Amyloid plaque formation occurs when soluble aggregates of beta-amyloid peptides, which are excised from amyloid precursor protein (APP), pass through a process that starts with the formation of oligomers (small clusters), and proceeds to the formation of fibrils (chains of clusters), and beta-sheets (mats of fibrils), finally ending in a configuration of plaques consisting of peptides composed of 39-43 amino acid sequences. There is evidence supported by research from Brigham and Women’s Hospital and Harvard Medical School (NIH 2010) that the plaque material most toxic to
neurons may be the short chain soluble oligomers, particularly those consisting of only two peptides. In light of this information researchers are investigating therapeutic approaches that target the transition of single beta-amyloid molecules to soluble dimers of two molecules in the hope of reducing the neuronal destruction that is associated with Alzheimer’s disease. Amyloid plaques are initially located in the cortex of the brain, where they appear prior to the onset of symptoms, and they ultimately flourish in the remaining regions of the brain as the outward symptoms of the disease become more and more apparent (Pimplikar 2009; Shankar et al. 2008).

It was clear to investigators even in the early days of research into Alzheimer’s disease that some cases of the disease had a genetic component. In families with a genetic history of Alzheimer’s the onset of the disease occurs at an early age, typically when people are still in their 40’s or 50’s. At least four genes have been identified that affect the development of early-onset and late-onset Alzheimer’s disease. The rare, familial, early-onset form is the result of mutations in three genes: the amyloid precursor protein (APP) gene located on chromosome 21, the presenilin 1 gene located on chromosome 14, and the presenilin 2 gene located on chromosome 1. Mutations in these three genes cause the breakdown of amyloid precursor protein to beta-amyloid. The fourth gene, ApoE, which is implicated in the more common late-onset form of Alzheimer’s disease is located on chromosome 19. ApoE has three alleles: e2, e3, and e4. Researchers believe that e2 may actually provide some protection against Alzheimer’s disease while e4 appears to increase the risk of developing the disease and e3 seems to play a neutral role in disease development. Most experts in the field expect that more genes associated with Alzheimer’s disease will be located in the future (Pimplika 2009; NIH 2010).

Currently there are three classes of drugs, non-steroidal anti-inflammatory drugs (NSAIDS), cholinesterase inhibitors, and memantine, that are used to provide symptomatic relief of the cognitive impairment that results from the defining characteristics of Alzheimer’s disease -- beta-amyloid plaques, tau tangles, atrophied brain issue, and enlarged ventricles. Chronic brain inflammation is one of the persistent characteristics of Alzheimer’s disease that accompanies all other pathologies. Some researchers believe it is the result of inflammatory substances that are released by activated astrocytes surrounding the beta-amyloid plaques. Investigators are studying the effects of NSAIDS, such as aspirin, ibuprofen, naproxen, and indomethacin, to determine whether or not they have an influence over these inflammatory substances. Epidemiological studies have suggested that the long-term use of NSAIDS is associated with a decreased risk of getting Alzheimer’s disease, but clinical trials have not yet shown any ability of NSAIDS to prevent or treat the disease (Choi et al. 2009; NIH 2010).

It has been known since the mid-1970’s that there is a sharp decline in the amount of the neurotransmitter acetylcholine in the brain of people with Alzheimer’s disease. This knowledge has prompted the study of cholinesterase inhibitors to determine if stopping or slowing the action of the enzyme that normally removes acetylcholine from the neuromuscular junction might have an effect on the progression of the disease. Donepezil, commonly known as Aricept, is a cholinesterase inhibitor that can be orally administered and is able to cross the blood brain barrier without complications. Some researchers believe that the use of cholinesterase inhibitors at high doses can also significantly reduce the amount of beta-amyloid plaque and perhaps play a role in increasing synaptic density. The mechanism of cholinesterase inhibitors with respect to Alzheimer’s disease is not yet fully understood, but it is believed that they are able to increase acetylcholine levels while simultaneously decreasing activity in the amyloid precursor protein (Dong 2005, 2009).

Memantine is an antagonist of NMDA (N-methyl-D-aspartate) receptors for glutamate in the brain. Glutamate, the most common excitatory neurotransmitter in the brain, plays an integral role in neurotransmission, primarily in areas of the hippocampus which are responsible for memory. When glutamate is produced in excess there is an influx of calcium ions into brain tissue. Neurodegeneration is more likely to occur in the presence of high levels of calcium; this may contribute to the onset and progression of Alzheimer’s disease. Memantines, acting as NMDA antagonists, interrupt glutamate signaling at the level of nerve synapses so glutamate...
levels can be lowered and the influx of calcium can be slowed, perhaps ultimately assisting in the stabilization of the behavioral, cognitive, and functional decline characteristic of Alzheimer’s disease (Scholtzova et al. 2008).

In addition to the treatments that are currently in use, researchers are looking in all directions hoping to identify non-genetic risk factors and protective factors for Alzheimer’s disease. Knowledge of these factors might possibly lead to new treatments for the disease. One area of research centers on increasing our understanding of the microvasculature of the brain to determine how changes that result from the normal aging process differ from changes seen in Alzheimer’s disease. Other researchers are looking at the association between belly fat in mid-life and late-life dementia. Their findings suggest that when people have excessive belly fat at age 40, they have a 3 times greater chance of getting Alzheimer’s disease in later life (NIH 2010). Still other researchers are examining a possible link between the destruction of blood vessels characteristic of uncontrolled type-2 diabetes and brain pathology leading to loss of cognitive function. There are also some interesting clinical studies that appear to suggest that neurotic people have an elevated risk of Alzheimer’s disease while those who are very conscientious may have a reduced risk of developing Alzheimer’s disease in later life (NIH 2010). Though neither personality trait correlates with brain pathology, studies like this would seem to illustrate the fact that all avenues are being explored in the quest for more information about the disease. In an effort to improve diagnosis of Alzheimer’s disease, some investigators are looking at the significance of asymptomatic cortical thinning, early movement difficulties, difficulty in identifying smells and certain types of hearing problems as possible biomarkers of the disease (NIH 2010).

Under the auspices of the National Institutes of Health, the National Institute on Aging, which includes the Alzheimer’s disease Education and Referral Center, has demonstrated widespread commitment to supporting research that might lead to promising new drugs for the treatment of Alzheimer’s disease. Specifically, the National Institute on Aging supports multidisciplinary efforts known as translational research that create a two-way loop linking laboratory studies and clinical research so that knowledge gained through research can rapidly be tested in clinical trials. Information gained in clinical trials can then be quickly returned to the laboratory for further study and refinement. To date, the National Institute on Aging has supported more than 60 studies pertaining to Alzheimer’s disease. For example, the Mt. Sinai School of Medicine examined the efficacy of the hypertensive drug, Valsartan, and found that it had the ability to alleviate the symptoms of Alzheimer’s disease in a transgenic mouse model. Curcumin, an ingredient in the yellow spice tumeric, has been investigated by a research team at the University of California in Los Angeles, and found to have multiple neuroprotective and anti-inflammatory properties, some of which reduce beta-amyloid plaque in mice and decrease cognitive impairment. Researchers at Northwestern University in Chicago are hoping to develop a novel class of anti-inflammatory drugs that will be capable of slowing the disease process without hindering the body’s immune response. A research team at the University of San Diego wants to develop a gene-vector therapy to deliver nerve growth factor, which may stimulate acetylcholine production in the brain of Alzheimer’s patients, and several research teams are trying to develop a safe and effective immunization for Alzheimer’s disease, the goal of which would be to remove toxic beta-amyloid peptides without increasing brain tissue inflammation (NIH 2010).

The Alzheimer’s Association projects that the cost of Alzheimer’s disease will total $1.08 trillion per year by the year 2050. They estimate that by that time 16 million Americans will have Alzheimer’s disease (Alzheimer’s Association 2010). Alzheimer’s disease is exceedingly complex and the hope is that research advances will continue to provide important clues to what causes it and what determines its progression. In recent years much has been learned about the normal aging of the brain and researchers hope some of this knowledge can be effectively employed to further our understanding of the processes at work in Alzheimer’s disease. In the future, breakthroughs will most likely come as a result of genetic analysis in association with high-throughput technologies and advances in neuroimaging, biomarker identification, and translational research coupled with clinical trials. We look forward to a time when Alzheimer’s disease will no longer be the most dreaded disease of the elderly and loving families can be relieved of the burden it imposes on everyone.

* Colleen McCloskey graduated from Arcadia University in May of 2010 with a major in Biology. Excerpts from her Senior Thesis “An Investigation of the Amyloid Cascade Hypothesis: Understanding the Mechanism of Neurodegeneration and Potential Pathophysiological Modifiers” appear in this article.
References


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Graduate students with teaching duties occupy a precarious position of simultaneous, sometimes conflicting, obligations. Past articles in the “Teaching from the Trenches” column explored the challenges we encountered when dealing with both our instructors and our own students. These difficulties are substantial, but there are also advantages to being a graduate student/instructor. Properly utilized, this position offers a powerful opportunity to improve our teaching abilities from our unique perspective. In this article, I examine how my role as a graduate student has impacted the way I behave as a teacher, and I discuss how the specific teaching techniques I have gained from formal education classes, as well as those I have observed during my science coursework, have changed (and hopefully improved) my teaching style.

I entered the anatomy education Ph.D. program with several years of teaching experience already under my belt. Admittedly, I was not a perfect instructor, but I loved the work and wanted to improve my abilities. But, at the same time, I did not know how to become a better teacher, or even if it was possible. My previous experiences as a student led me to believe that some instructors were intrinsically “good” and others were “bad.” My criteria for “good” and “bad” were simple: a good instructor makes complicated topics easy to understand, and a “bad” one fails this task. I certainly did not think that acquired skills and teaching methods could contribute significantly to one’s overall competency as an instructor since I viewed teaching ability as an innate amalgam of personality and “unlearnables.” As far as I was concerned, new pedagogical techniques never worked in the classroom; I had heard too many instructors say, “We’re going to try something new in class today...” with almost universally disastrous results. In retrospect, these were all examples of techniques -- such as “think-pair-share”, “muddiest point”, and “problem-based learning” -- being deployed without any connection to reinforce the main course objectives.

My rudimentary teaching style began to form during my undergraduate years. Viewing classroom instructional “techniques” as mainly useless, I rejected all of them in favor of what I regarded as simple communication of facts. My operational metaphor for teaching was a cable transmitting facts for the students to interpret and use, without the need for a provided structure. As I now know, this system is not the most effective one for reaching the broadest population of students, and I am sure my lack of pedagogical technique left many students struggling. My teaching style and philosophy did not change much for these first few years; I lacked the understanding required to change my methods, and my repeated shortcomings led to a lot of frustration for both my students and me. I realized this shared frustration eventually, but, in keeping with my teaching philosophy, I attributed it to my inherent shortcomings; I felt doomed to remain a bad teacher.

My first education class provided me a theoretical basis for understanding why some instructors succeed where others fail. This eye-opening experience radically changed my teaching philosophy. I realized that the “good” and “bad” teachers from my past had done almost the same things in the classroom, but the “good” ones integrated their teaching techniques with the course learning objectives. As I studied the theories behind the instructional techniques I had seen as an undergrad, I concluded that most of these techniques were, indeed,
sound but had not been used properly. They only work when coupled with a solid foundation of facts, and they require the teacher’s enthusiasm and follow-through. My best teachers had used these same techniques in class but had integrated them so well with the course objectives that, from my perspective as a student, the instructional techniques flawlessly blended with, and disappeared into, the presented material. The less effective teachers failed at integration; the instructional techniques actually obscured the content they were meant to deliver.

One instance where an attempted instructional technique proved less effective than a traditional lecture occurred during a freshman-level biology course. For one session the instructor divided us into small groups, gave us reading material on DNA synthesis, and instructed us to develop an understanding of the process through discussion within the group followed by reporting what we had learned to the rest of the class at the end. Without providing any prior formal introduction to the material, any guidance during the session-long activity, and no more than limited guidance following the activity, the instructor missed an opportunity to help students learn because the activity utterly failed to deliver the content it was intended to convey. And yet, I have also experienced successful applications of similar group discussion methods. These occurred when the instructor provided adequate starting material, as well as a full debriefing at the end, in order to prevent students from confusing facts with misconceptions voiced during discussion.

I modified my metaphor for teaching to accommodate the proper role of instructional techniques: teaching is helping a student to assemble “scaffolding,” for which the instructional techniques are the building materials. Each technique, properly applied, should help the student use his or her scaffolding to connect new facts to existing facts already in mind. Assisting students with building these scaffolds results in a more efficient learning experience because each new fact is guided into the proper relationship with existing facts.

More successful teachers hide the scaffolding to aid the delivery of content, but this may actually hinder students in the long run since it makes it difficult for them to determine which techniques work best for their own learning. Personally, it was not until I began to study educational techniques that I realized why I performed better in some courses than in others, and why I was more comfortable with some teachers’ styles than with others’. There should be a certain amount of transparency in the educational process: enough to allow students to learn the metacognitive skills associated with instructional techniques, while still mastering the content the techniques are meant to deliver, but not so much as to bog them down with pedagogy. Thus, the best teachers not only successfully deliver the course content but also guide each student to identify and understand which instructional techniques help him or her learn best.

One well-integrated technique I have encountered in multiple classes is the frequent quiz, which may be given daily or weekly, depending on instructor discretion, but almost always takes place at the beginning of class. This low-stakes method of evaluation reinforces recent course content and encourages a higher level of student engagement. The frequent quiz lends itself well to integration with course content because each quiz covers only a small amount of material and provides the student with another source of instructor feedback. This technique also forces the students to review the material on their own and gain more practice using metacognitive tools to predict quiz questions. I had seen and appreciated this technique long before I understood exactly why it was effective, and now I try to use it with my own students whenever possible.

Another benefit of my formal studies in education was my introduction to the Scholarship of Teaching and Learning (SoTL). Given my background in science, I was particularly excited to see that educational interventions could be analyzed with scientific rigor. An appreciation of SoTL as a scientific discipline was key to my philosophical shift. I now value educational research as an effective sociological tool for objectively evaluating and improving instructional techniques. Indiana University has a strong interdisciplinary program devoted to promoting SoTL, with more information available at the website http://www.indiana.edu/~sotl.

At this point in my Ph.D. program, not only have I changed the way I scaffold my teaching, but I have also begun a SoTL project to investigate undergraduate student study habits this summer semester. For this project, I designed and administered a survey tool to determine student study habits outside of anatomy lab. This survey questions the student’s use of twenty-five specific study habits, as well as his or her amount of study time and previous anatomy experience. Currently, I am correlating these data with scores from the first two lab exams to see if any specific types of study skills correlate with higher lab exam scores. I also intend to re-administer this same survey at the end of the summer session to see if study habits have changed and if this correlates to higher lab exam scores. I hope to apply what I learn from this project by providing future classes with more effective ways to learn the vast amount of required material. By assessing student habits through statistical analysis of a carefully designed survey, I am applying scientific principles to the advancement of education in order to avoid the pitfalls I have seen in less skilled instructors.

The theories of education I have learned in my education classes have undoubtedly made me a better teacher. Not only do I find my students more engaged, which rewards me with a better personal teaching experience, but my student evaluations have also consistently improved since I entered this program.
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Never Work Harder Than Your Students & Other Principles of Great Teaching

Robyn R. Jackson. 2009.
Alexandria, VA: Association for Supervision and Curriculum Development.

Reviewed by
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I should acknowledge at the start that this book is written explicitly to and for the K-12 classroom teacher. As a result many people teaching at the college level will have a harder time connecting with the author’s central message than they would with a book written explicitly for the college level. Robyn Jackson, Ph.D., is president and founder of MindSteps, Inc., a consulting firm she started after 10 years as a National Board Certified English teacher and middle school administrator. Her firm “offers consultation services, workshops, publications, and free resources designed to help raise student achievement by increasing the professional capacity of teachers and school leaders.” [http://www.mindstepsinc.com/about.asp] She is interested in helping instructors develop the Master Teacher Mindset which she defines as “a way of thinking about instruction, about students, about learning, and about teaching in general that makes teaching fluid, efficient, and effective.” (p. 2) A consistent theme throughout the work is her assertion that the best teaching results from well-developed habits of mind and deliberate reflection on the results of current practice rather than innate talent alone or fortuitous single moments of blinding inspiration.

On p. 4 in the Introduction Dr. Jackson lists her seven principles:

1. Master teachers start where their students are.
2. Master teachers know where their students are going.
3. Master teachers expect to get their students to their goal.
4. Master teachers support their students along the way.
5. Master teachers use feedback to help them and their students get better.
6. Master teachers focus on quality rather than quantity.
7. Master teachers never work harder than their students.

She then explicated each of the specific principles in its own chapter, with specific examples, and ends with a summary chapter, “Putting It All Together.” The author is quick to admit that the basic ideas of her master teacher mindset are not unique to her. She herself at one point characterizes them as what those trained in pedagogy would be expected to learn in “Teaching 101.” However, for people new to teaching, Dr. Jackson’s treatment of these basic principles of modern constructivist and outcomes-based pedagogy is quite approachable and potentially novel food for thought. She also provides some practical ideas and tools for assessment of student learning, an increasingly prominent feature of accreditation in higher education.

Dr. Jackson’s text makes some points that I think are well taken for the college instructor. For me, the two most thought-provoking chapters are chapter three about setting our ultimate goals (or learning outcomes) for students and chapter eight about deciding what is the legitimate work for the instructor and what is the legitimate work for the students. The primary stumbling block for the true novice will be the translation of her K-12 examples to the college context.
In chapter three Dr. Jackson emphasizes how clear educational objectives make the teaching and learning process easier to negotiate for both instructors and students. Even though I understood this concept before reading this book, I found this chapter engaging. Knowing where you are going (and why) takes some up-front design work. I agree with Dr. Jackson (p.60), “If the goal is asking students to master content, then you have quite a bit of flexibility on how students learn that content. If the goal is asking students to master a process, you have flexibility in the content you can use.” This may sound self-evident, but it has a power to free us from some self-imposed constraints about “coverage.” There are ways of holding students accountable for content without having to deliver all that content specifically and explicitly ourselves. Likewise most of us have educational goals for our students that go beyond mere repetition of memorized information. Explicitly sharing with students when and how they will be asked to demonstrate the so-called higher order thinking and communication skills is not equivalent to “spoon-feeding.” Clear expectations of process goals does not reduce student performance to only content mastery and does not necessarily make demonstration of those skills a sure thing.

I found the “never work harder than your students” chapter to be the most intriguing and the chapter that may provide the most food for thought for the college instructor. It raises some interesting questions within the college context. What is the legitimate work of the college student? Can I blame them for failure at tasks for which I could reasonably expect them to be underprepared? Do I really have to sacrifice my performance standards in order to get an acceptable pass rate? Dr. Jackson’s answer would be that if one is serious about practicing the mindset of master teaching, then one does have a responsibility to know where one’s students are developmentally. But she would challenge the notion that poorly prepared students are incapable of getting better, or of gaining some foundational understanding of what an instructor has identified as truly important. She would also reject the counter idea that the instructor must always be the one responsible for figuring out how to make up the difference between current student performance and desired student performance. She would contend that finding ways to provide better and more targeted feedback to students so that they can be involved in the creation of viable solutions to their own learning problems is a profitable use of our time as reflective practitioners of teaching. I tend to agree with her.

I think this book has a great deal to offer both the novice and experienced college instructor. Not everything she says will fit you and your institution, but there are good topics for spirited debate among colleagues interested in the teaching/learning dynamic. If you teach at an institution with a teacher education program, you may already have a copy in your library’s holdings. It is worth checking out.

Salvatore “Sam” Drogo
July 4, 1948 - September 1, 2010

HAPS has lost a treasured friend. Sam Drogo, our colleague, mentor, and friend, passed away unexpectedly on September 1, shortly after completing one of the things he loved doing -- teaching a class of A and P students. We are all stunned and saddened by the loss.

Sam was a catalyst for change, both at his home institution, Mohawk Valley Community College (MVCC), and in HAPS. He was the driving force in the use of the latest technology in the classroom and the laboratory, and he presented annually at HAPS, usually on ways to incorporate technology in teaching. He was essential in the development of our state of the art cadaver-based Anatomy and Physiology lab at MVCC and was a strong proponent of our active, inquiry-guided approach to learning. He was an active and loyal HAPS member; he served for many years on the HAPS Testing Committee and participated in the development of both the national A and P curriculum and the HAPS Comprehensive Examination.

Sam received both the MVCC award for Excellence in Teaching and the State University of New York Chancellor’s Award for Excellence in Teaching. Loved by students, Sam was a Master Teacher. Respected by his colleagues, Sam was a Master Mentor. HAPS has lost a valued friend.
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 this EDU-Snippets column, 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. The following Snippets are certainly no exception. The members of HAPS always come through with flying colors! Please keep your wonderful ideas coming.

I. Oral Snippets – Testing the Idea

When the call went out for the previous EDU-Snippets column (Summer 2010), the idea of oral tests came up. Immediately questions were raised about how this would fit into an EDU-Snippet column. Before long, oral exams turned into oral snippets and became the primary theme of this Fall 2010 column.

A. Introducing the Oral Test

Johnny Lloyd (Aurora University, jlloyd@aurora.edu) started this off by suggesting we could make better use of oral exams, particularly in the teaching of surface anatomy. Included with the idea were some “student satisfaction” statistics. Most students were quite satisfied.

This left just two problems – defining oral tests and getting some examples. Johnny Lloyd sent one example (see below), but more were needed.

B. Defining Oral Tests

Have you ever tried to define an ORAL TEST? It may not be as easy as you think! EDU-Snippets threw the question out to the reading public and was amazed at the variety of results.

Chris Boudrie (Lourdes College, cboudrie@lourdes.edu) summed up the problem very well by saying:

Gee, I guess I didn’t think about multiple definitions. For me, an oral exam is a planned and prepared test between an instructor and, typically, a single student, covering a prescribed content and employing an explicit format, occurring without notes or study aids.

Tom Lehman (Coconino Community College, Tom.Lehman@coconino. edu) came up with a rather inclusive definition of an oral exam.

An exam where the instructor (or proctor) reads the questions to the student. The student is given a prescribed amount of time to prepare and give an oral answer to each question. The answer may (depending on the instructor’s instructions) include the use of models, diagrams, or drawings.

Tama Fox (South Seattle Community College, auntama@gmail.com) added another dimension to the definition.

I would add that there is a conversational component between examiner(s) and examinee(s), often to lead a veering examinee back on track.

Ken Saladin (Georgia College & State University, ksaladin@windstream.net) stated that he hadn’t thought in terms of multiple definitions either but that the proof seemed to be in the group answers.

Ken further defined an oral exam as a test of knowledge in which the examiner presents the questions orally and the examinee replies orally.

In the process of putting together this column, a number of questions came up concerning variations on the basic idea of the oral exam. Here are a few of the more interesting questions.

- Is the oral exam limited to a one-on-one situation?
- What about a small group response to a particular question or problem within a particular time frame?
- Is it an oral exam if the instructor gives the questions orally and the student writes the answers?
- Is it an oral exam if the questions are presented in writing but the student is required to answer them verbally?
- What if the student is called on to sketch or diagram something as part of an oral explanation?

(Continued on next page)
C. Examples

1. Starting the Students

In addition to starting off EDU-Snippets with a topic, Johnny Lloyd (Aurora University, jlloyd@aurora.edu) included a good way to get students into the feel of the more complicated oral exams they may be faced with later.

The cumulative oral exam is conducted in the last lab period with professor and student sitting across from each other and the professor asking the student to identify specific points and to answer questions from a question bank. These questions are asked in a random fashion. To help them prepare, the students are given the questions two weeks before the oral exam. This exercise is also a way to have a cumulative type of lab exam over the various systems covered in that particular semester.

2. Another Way to Do It

Robert Rawding (Gannon University, Rawding001@gannon.edu) explained his use and interpretation of the oral examination.

Students hear each question from the examiner (me) and must answer the question orally to the examiner (me). Each respondent may take a brief moment to collect thoughts before answering the question. I may or may not choose to request further clarification of the student’s statement(s) – usually at the end of their response. I also allow the student to ask for clarification of a point regarding the query that I made of him or her. I have given single person and two person oral examinations; in the latter case they may feed off of each other’s response(s) – the two person oral exam is graded more stringently because of that option.

I look for key points, terms, or ideas that I have written down and which are before me as a rubric – which I think is important in grading these types of examinations. Reading facial expressions is important – the eyes often tell a tale of happy energy or saddened discomfort. I wait until all examinations are completed before posting grades, and I keep a large repository of questions so that no person or duo gets the same question as anyone else. This cuts down on “grapevine advantages” that would unfairly benefit students scheduled later.

I have had oral examinations vary in length from 15 minutes to more than a half-hour. It depends on the point value of the examination. Naturally these examinations are time-consuming so I administer them to small classes of 12-15 students.

3. A Torso Model Oral Exam

Chris Boudrie (Lourdes College, cboudrie@lourdes.edu) uses a torso model oral exam.

I use an oral exam as a summative experience at the end of A&P II lab and have done so for a number of years. This requirement, which carries a point value of 20 (out of a 600 point course total, equivalent to two lab reports) is spelled out in our syllabus and the students are prompted to prepare for it as we progress through the semester.

I utilize a fabulous large torso model with male and female reproductive inserts for this purpose. The premise is that all soon-to-be graduates of A&P ought to be able to demonstrate gross anatomical structures in a familiar model, which they have studied for 30 semester hours. The ability to perform this skill is a very useful segue into the students’ clinical programs. An oral exam in a course taught on a systems-anatomy basis allows me to add an element of regional anatomy to our studies.

The Torso Model Oral Exam takes twenty to twenty-five minutes per student. Sometimes I have the students work in pairs and we go back and forth between them to identify structures on the model; in this case, we can accomplish the exam in about a half-hour per pair of students. Using the model, we proceed from superior to inferior (or vice versa, the students’ choice) and the students call out the names of gross anatomical structures and the system to which they belong. Each student is allowed one error during their exam. If it is apparent after a minute or two that the student is not ready, i.e., their answers are hesitant or incorrect, they can have a fresh start on the next scheduled laboratory session. A successful exam is worth twenty points. Two to three errors earns ten points. Four or more errors results in a score of zero.

Students tell me that it is very gratifying to see how much they know at the end of their long journey through Anatomy and Physiology.

I hope this idea might pique some interest!

D. Personal Experiences with Oral Exams

Several people shared their personal experiences with giving oral exams.

William Karkow (University of Dubuque wkarkow@dbq.edu) started by explaining his tactic.

Speaking of experiences with oral exams, having personally faced an oral exam for licensing as a surgeon, and knowing the anxiety involved, I use this feature as a way to deal with students who desire to procrastinate and offer lame excuses.

At the beginning of A & P, I tell all students, “Any missed exam may be made up after the fact, but the make-up exam will be an oral exam in my office.” Though my faculty colleagues occasionally whine about the burden that making and
grading extra exams costs them, I smile and recall that my policy has resulted in 1 or 2 make-up exam visits per year. Even the students with legitimate excuses known in advance seek ways to change their schedules and accommodate the test time for regular multiple choice exams, intimidated by the thought of a personal oral exam.

So I definitely recommend using this fear to your advantage!

David Evans (Penn College, devans@pct.edu) has had similar experiences.

I have a similar requirement for lab practicals. Result? I have probably given 3 in the last 30+ years

By the way, don’t get us Ph.D.’s to start commiserating about oral exams! As far as I know, worldwide, all of us have to take the dreaded oral preliminary examinations for the Ph.D. They are called prelims but they are actually taken after GRE’s and (in some cases) qualifying exams and having at least a B.S. I don’t know anyone who does not have some horror story about them and the anxiety that abounds. A friend totally bombed his at UI/UC the week before I took mine with the same committee! I prevailed by some stroke of luck (and YEARS of study!). Ask me, we will cry, and we can have a beverage together in Victoria!

Roberta Meehan (Maricopa County Community College District, biology@ctos.com) has used a similar tactic many times.

I have it in my basic syllabus that make-up exams may or may not be similar to the ones given in class. That gives me a bit of leeway or discretion. They also know from the beginning that the make-up will probably be oral, will be given one-on-one, and that anything is fair game. I, too, get virtually no make-up requests.

E. Humorous Snippets

Needless to say, the subject of oral exams did bring out some humor. Of course, since the humor deals with anatomy, it is apparently humor(o)us/humerus. You may find something here to insert into some humorless oral exam.

Jason LaPres (Lone Star College, jason.h.lapres@lonestar.edu) defined the oral exam like this: An oral exam is something a dentist does.

Ken Saladin (Georgia College and State University, ksaladin@windstream.net) stated that an oral exam was: Any test administered at a particular sectarian university in Tulsa.

II. Incoming Idea (Future Snippet)

An intriguing thread wound its way through the HAPS discussion list. That thread dealt with PowerPoints. Some people find them powerful, some people feel powerless without them, and some people find them to be more trouble than they are worth.

I think it would be a good column to have some EDU-Snippets on creative ways to use PowerPoints – ways that help our students learn without putting them to sleep and without being a substitute for solid teaching.

III. 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! Your ideas are tremendous! Keep in mind the suggestion about PowerPoint Snippets. If you have thoughts on this topics (or on any other topics!), EDU-Snippets would love to hear from you!

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!

(Continued on next page)
HAPS has experienced great growth and change over the past few years. Among these changes has been the development of the HAPS Foundation in 2009. Here we discuss the motivation and reasons for forming the Foundation and the purpose of the Foundation Oversight Committee, and provide a summary of activities related to the foundation itself.

Why does HAPS need a Foundation? Background and History

HAPS grew from its modest beginnings in 1989 to a large, successful organization with approximately 1500 members. While membership dues and our annual meeting help fund the regular running of the organization, HAPS does not have sufficient funds to pursue and develop current and future initiatives. A Foundation allows HAPS to build our coffers and provide the organization with the necessary funds to advance current and future projects.

For example, one of HAPS’ most successful current initiatives has been HAPS-Institute (HAPS-I). HAPS-I was implemented several years ago and quickly grew and surpassed all expectations. The workload involved in running this program increased exponentially. While one person initially managed HAPS-I, it now requires many individuals to manage the program, mentor new faculty, answer scholar questions, enroll new scholars, manage the website, and more. While HAPS-I tuition and sponsorships help defray some costs, more cash inflow is needed to see this program continue to expand and flourish, and not simply ‘die on the vine’ for lack of funds.

Other initiatives already underway at HAPS include the Learning Outcomes Project, HAPS standardized exam online testing, and using technology in teaching. There have been other initiatives discussed among HAPS Board and Steering Committee members, but some of these initiatives have been tabled for lack of ‘seeding funds.’ The HAPS Foundation was formed so we would have a self-sustaining fund that would be a source of income to promote these initiatives and build future programs that show promise.

Several HAPS members were instrumental in the development of the Foundation. Philip Tate initially researched and developed a plan for establishing a foundation. Joe Griswold, Judi Nath, and Mike Nath worked with Phil and compiled the research and background information necessary. As a lawyer, Mike Nath was instrumental in preparing the legal documentation HAPS needed to properly establish the foundation.

At the HAPS 2009 annual meeting in Baltimore, HAPS President Kevin Petti discussed the proposal of developing a foundation and brought forward the motion of formally establishing the foundation at the annual business meeting. HAPS members voted and overwhelmingly approved the motion, and the HAPS Foundation thus came into existence in 2009.

Mission of the Foundation

The Foundation’s mission is to establish and manage trust funds for HAPS. Monies from the trust funds are used to support HAPS’ educational, scientific, and charitable activities through grants, scholarships, and disbursements to HAPS’ general fund.

What is the Foundation Oversight Committee (FOC) and how does it relate to the Foundation?

Once the Foundation was approved by HAPS members and established, a Foundation Oversight Committee (FOC) was formed. The FOC is responsible for making recommendations to the HAPS Board of Directors to ensure that fund monies are securely invested, available for foreseeable disbursements, and return a reasonable rate of income or growth. The committee also publicizes the Foundation, solicits donations, and reports Foundation status to the membership.

Judi Nath, one of the key developers of the Foundation, served as FOC Chair from 2009 to June 2010. The current Chair is Valerie O’Loughlin. Members of the committee assist the chair with the Foundation’s mission. If you are interested in serving on the committee, please contact Valerie at vdean@indiana.edu.

(Continued on next page)
What have the Foundation and the Foundation Oversight Committee done since their inception?

After the Foundation was officially established, The Foundation Oversight Committee contacted HAPS’ textbook authors who had previously agreed to provide seed money via an Author Challenge. Many HAPS authors rose to the occasion and donated generously. These authors were among the first contributors.

Over the past year the FOC has worked with HAPS staff and committee members to streamline the contribution process, publicize the Foundation, and encourage donations. At the 2010 annual conference in Denver, the FOC and Grants and Scholarships Committee hosted a table in the exhibitors’ hall to promote the Foundation. Individuals who donated $20 or more were entered for a chance to win a $100 Amazon.com gift card. Terry Thompson of Wor-Wic Community College (Salisbury, MD) was the winner of the gift card. After the Denver meeting (and just one year since its inception), the Foundation now has $10,425 in its treasury! Our original goal for the Denver meeting was to reach $10,000, so thank you for helping us reach our goal. We hope you all will continue to be able to help our efforts in the future.

Future goals

In order to ensure that a Foundation is enduring and long-lasting, the principal from the Foundation cannot be used for disbursement. Rather, it is the interest that is accrued from the principal that will be used to fund initiatives. Thus, in order for the HAPS Foundation to be able to fund initiatives and still be self-sustaining, the HAPS strategic plan has set a five year goal of $500,000 for the Foundation. While this may seem daunting, we believe this effort is achievable if every HAPS member participates. At the same time, the FOC will work to look for support from grants and other foundations as well as our corporate sponsors.

How YOU can help HAPS and the Foundation

There are many ways you can help the Foundation and HAPS as a whole. Monetary contributions to the foundation are welcome and are tax-deductible as allowed by law. You may make a secure online donation on the HAPS website at: http://www.hapsweb.org/displaycommon.cfm?an=1&subarticlenbr=285. The Foundation Oversight Committee welcomes enthusiastic members to its ranks. If you have fundraising experience, you are especially encouraged to join us! Please contact the FOC Chair, Valerie O’Loughlin (vdean@indiana.edu) if you would like to serve on the committee and take an active role in the future of HAPS.

THANK YOU!

The HAPS Foundation Oversight Committee would like to thank the following individuals who have donated generously to the HAPS Foundation (December 2009 – September 2010):

Donations up to $1500:
Jackie Butler*
Ric Martini*
Kevin Patton*
David Shier*
Dee Silverthorn*
Philip Tate*

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What’s new on the Web
Web and Technology Committee

Tom Lancraft, Chair
St. Petersburg College/Gibbs Campus
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As the Chair of the Web and Technology Committee it is my responsibility to update the membership on changes in the Society’s websites. With the help of Robin Hurst, HAPS Webmaster, we have taken advantage of the summer break and have really made some big changes.

In the last month, we have made the following modifications of the HAPS website (www.hapsweb.org)

- Completely reworked the Homepage look and feel
- Added public pages for all committees
- Added member login required pages for some committees
- Added free “example issue” HAPS Educator page for visitors
- Updated HAPS Educator latest issue and archive pages
- Updated HAPS Educator submission policies page
- Updated all HAPS Institute public pages
- Built new password protected pages for HAPS I Faculty
- Built new HAPS Foundation pages for donation
- Updated Meetings web pages for annual and regional conferences
- Updated Contact HAPS page

There is more to do but these new and enhanced pages should make browsing the website a lot more valuable to you.

In order to make it easier to find what you need in the website we have made major changes in the Member’s Area/ Login navigation page and the Resources navigation pages. These navigation pages, found on the Homepage, now provide one click access to most of the website components. Other navigation aids have been created but you will have to use the site to see the difference.

We also want to add more interesting items (which we call Features) to the website. One feature is the Public Affairs pages where we are in the process of transferring the wonderful email lists of new and notable articles, from David Evans, into a new web page format. Soon, the article links will be much more accessible. We are also planning to roll out a new feature called the Histology Challenge blog. In this feature, Bill Karkow will provide us with some interactive quizzes -- something very different for our website. I have asked the Board members and Committee Chairs to add some features of their own. Maybe you have an idea of your own?

And lastly, I want to introduce you to the wiki websites. We already have several resources available in the Histology Database and the Teaching Resource wikis. Stop by those sites and check out what other members have contributed.

And, of course we want you to be part of this process. After all, most of these modifications are the result of suggestions that came from you, the members, so keep sending your ideas! If you have any comments on how to improve our website, please contact the Web Editor (webeditor@hapsweb.org).
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The Committee Chairs invite input from HAPS members and willingly provide information on the activities of their committees.