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HAPS-EDucator is the official publication of the Human Anatomy and Physiology Society (HAPS) and is published four times per year. Major goals of the Human Anatomy and Physiology Society are to promote communication among teachers of human anatomy and physiology in colleges, universities, and related institutions; to present workshops and conferences, both regional and national, where members can obtain information about the latest developments in the health and science fields; and to encourage educational research and publication by HAPS members.

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Cover art: Kevin Petti, President Emeritus, took this photo of Galileo’s Podium in the lecture hall in Padua, Italy, last summer. See Kevin’s article “Anatomia Italiana,” on page 10, for his summary of his tour of museums and universities that showcase the history of anatomy education.
Hello HAPSters!

I hope everyone has a chance to relax a little this summer. If you were at the annual conference in Denver, I hope you have recovered from the social marathon that is a HAPS conference! Thank you to all of the members who were able to attend and sincere thanks to all of our vendors who support HAPS: you are the best! And finally, thank you again to Terry Harrison and his conference planning committee; “Funk if I Know” how to adequately express my appreciation for all of your hard work! You all did a fantastic job and were wonderful hosts!

At our annual meeting, I had a chance to share some of the things that HAPS members have been working on this year. We hired Dr. Larry Spraggs, our first Executive Director (and he can dance too!), who has been leading the board through a strategic planning process. At the meeting, I outlined that we have begun discussing how to serve our membership and reach out to new members. We are also working to develop sustainable business models for the entire organization. In addition to working with the Board of Directors, Larry will also be meeting with individual committees to help them develop and grow.

At our annual Board of Director’s meeting, we also highlighted the accomplishments of some of our committees and long-standing HAPS members. Elizabeth Hodgson (Membership Committee chair), her committee, and the Regional Directors reached out this year to former HAPS members and added one hundred people to the organization. Judi Nath (HAPS Foundation Committee chair) and her committee have grown the HAPS Foundation from a good idea that we voted to create last year to an endowment of ten thousand dollars. Thank you especially to everyone who has generously pledged and donated! Eric Sun and Curtis DeFriez (Testing Committee co-chairs) described how the HAPS Exam is ready to go completely on-line and that interest in the exam increases every year. Ellen Arnestad spoke on behalf of the HAPS Institute, which continues to be one of the jewels in our organization; a new neuroanatomy course is being offered this summer, with other courses planned for later this year. Another accomplishment I want to note is that Marsha Sousa (HAPS EDucator editor) has published four editions of HAPSED on-line. Thank you, Marsha, for all of your excellent work! We also wish Mike Glasgow and Mary Lou Percy all the best as they plan their retirements. Please have fun, relax, and come join us again. You both deserve all the best!

Every conference signals the end of one year and the beginning of a new year for me. Looking ahead, Peggy Hunter introduced us to Victoria, British Columbia, and her 2011 conference planning committee. Please stop by the HAPS home page for updates. It looks like it will be an amazing conference! I also want to welcome two new members to the Board of Directors. Congratulations to Anne Geller, our new Western Regional Director, and President-Elect Don Kelly. I look forward to working with both of you this year! We will also be saying good-bye to two outstanding Board members. Thank you Kevin Petti (Past-President) and Glenn Yoshida (Western Regional Director) for your service to HAPS, your counsel, and your friendship. It has been an honor serving with both of you for the last two years. Finally, congratulations to Caryl Tickner, who will move from President-Elect to HAPS President on July 1st (I will serve my last year on the Board as Past President). The organization is in good hands under Caryl’s leadership.

Eleven months ago I was preparing to lead my first Board meeting and I remember thinking: “Oh my god, I have to do this twelve times!” Now I look back with disbelief at how fast the year has gone by! The members of this organization have touched my life in ways I cannot begin to describe. You are friends, extended family, and respected colleagues. Thank you so much for the privilege of serving you this past year. It has been one of the best experiences of my life and I am grateful to all of you!

Have a wonderful summer and if I don’t see you this year, I look forward to seeing you in Victoria in 2011!

Best wishes to you all,
John Waters
President, Human Anatomy and Physiology Society
johnwaters@psu.edu  814-863-1154
I recently returned from an incredible week in the Mile High City and my first HAPS Annual Conference. I now know what a HAPSter is... an incredibly friendly critter, with unlimited energy for fun and self improvement as an educator with a voracious appetite for knowledge, food, and drink. The dancing rituals of the HAPSters were of particular interest (I have a minor in Anthropology and Sociology) and I have to admit it pulled me in as a happy participant.

It was a pleasure to meet so many members of the Human Anatomy and Physiology Society in Denver. I had been working with the society and the Board of Directors for five months, but only knew people "electronically" and from the occasional voice via telephone. The board and I have worked hard on a strategic plan for HAPS since the beginning of the year. We hope to have this finalized by the end of June with the completion of a five year strategic plan. It is a clear outline of the organization's aspirations and will provide direction and goals to reach by the various committees. If you want to join this exciting initiative, working on one of the committees is a great start towards personal service and leadership of our great organization.

I will be working with all of the committees to help them achieve their goals. The board has asked me to spend much of my time working with the incredible leadership team that has created and sustained the HAPS Institute. I think there is a great opportunity to make this a signature program of scientific and educational continuing education at the national level. Initiatives of the HAPS Foundation, the Testing Committee and the Web/Technology Committee will also provide me with some very interesting and creative work over the next year. My ultimate goal is to expand and enhance member services at every level.

I have had the pleasure of working with President John Waters since January. His leadership of our organization has been outstanding and he will leave this position with numerous accomplishments. I wish him well as he transitions the leadership to our next President, Caryl Tickner. My conversations with Caryl make it clear that we have another exciting and productive year ahead of us. Again, I encourage everyone to get involved in committee service in support of the talented HAPS leaders. Your active participation will bring you lots of pleasure and professional satisfaction.

Sincerely,

Larry

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The HAPS-I Update

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The HAPS Institute Founders

It is difficult to believe that HAPS-I really only started its first courses at the annual conference in San Diego just three short years ago – it has grown so fast! With all of the new scholars that we have had and the massive interest in HAPS Institute, I thought I would take this opportunity to tell people about the talented and dedicated people who started the HAPS Institute and continue to make it work.

In 2006, HAPS president Ric Martini, past president Sandy Lewis, and president-elect Joe Griswold were struggling to find ways to help HAPS members who were being impacted by new Southwest Association of Colleges and Schools (SACS) accreditation rules. SACS proposed that all human anatomy and physiology instructors must have a Masters or a PhD in human anatomy and physiology. This was later revised to include an option for 18 graduate level credits in anatomy and physiology plus an MS or PhD in a related discipline such as zoology. If applied nationwide, these rules would have disqualified 95% of HAPS members from teaching human anatomy and physiology. This was later revised to include an option for 18 graduate level credits in anatomy and physiology plus an MS or PhD in a related discipline such as zoology. If applied nationwide, these rules would have disqualified 95% of HAPS members from teaching human anatomy and physiology. This was later revised to include an option for 18 graduate level credits in anatomy and physiology plus an MS or PhD in a related discipline such as zoology. If applied nationwide, these rules would have disqualified 95% of HAPS members from teaching human anatomy and physiology. This was later revised to include an option for 18 graduate level credits in anatomy and physiology plus an MS or PhD in a related discipline such as zoology. If applied nationwide, these rules would have disqualified 95% of HAPS members from teaching human anatomy and physiology.

This estimate is based on a survey of about 550 HAPS members. While Ric, Sandy, and Joe were battling the SACS injustices on many levels, one of their responses was to create a continuing education program that would help instructors earn graduate credit in Human Anatomy and Physiology. No formal graduate level continuing education courses targeted for undergraduate A&P instructors were available at that time, particularly any with an emphasis on both subject matter content and pedagogy.

Although the idea for some sort of continuing education program had been discussed within HAPS from time to time over the years, there were usually too many projects going on to venture into that arena. The advent of the SACS crisis created a pressing need for it. The board could also see a real bonus in providing pedagogy education to instructors who, for the most part, are subject matter experts, but have little grounding in educational theory or skills. In January of 2006, the Board voted to approve a course development initiative, and authorized Joe Griswold and Sandy Lewis to move forward on planning.

By October of 2006, a continuing education taskforce had been formed, with Kevin Patton as chair. Kevin is a HAPS president emeritus with extensive leadership experience. He is a founding faculty member of St. Charles Community College where he helped build the science program and was president of the Faculty Association among other impressive parts of his resume. The task force also included Jennifer Lundmark and Ellen Arnestad, with Joe and Sandy as ‘friends’ of the committee. Together, this group created the ‘team’ that figured out how to make HAPS-I actually fly.

The team envisioned a comprehensive content and pedagogy program for instructors of Anatomy and Physiology that would grant post-graduate continuing education credits to our members. While Kevin, Jennifer, and Ellen looked at the educational philosophy and design of the courses, Sandy Lewis was instrumental in figuring out how we could partner with universities to get post-graduate credit and have access to a computer-based learning platform.

Sandy originally talked to Dr. Tana Hasart, the President of Pierce College Puyallup, and formerly Vice-Chancellor of University of Washington Bothell. Dr. Hasart introduced Sandy to administrators at the University of Washington (UW) Bothell, who were excited about the project, but unable to offer anything higher than 400-level courses, which would not give us the post-graduate credit that we were looking for. The administrators at UW Bothel then referred Sandy to Mary Pat Wenderoth at UW Seattle. Sandy met with Mary Pat, who shared our passion for the idea and helped us get it off the ground. Our relationship with UW Seattle and Mary Pat has been wonderful and has really been what sets our program apart from other continuing education programs.

Sandy and Dr. Hasart also helped us create a working relationship with Pierce College Puyallup for our online learning platform. We could not have afforded our own learning platform and the infrastructure that would be needed, so the relationship was very beneficial for us. Because of our relationships with UW Seattle and Pierce College... (Continued on next page)
we have been able to establish a reasonable fee structure for the HAPS-I courses. As a side note: HAPS honored Dr. Tana Hasart at this year’s annual conference for her role in helping connect HAPS to UW Seattle and Pierce College, relationships that have been essentially in developing HAPS-I.

While Sandy was creating these relationships, the team of Kevin, Jennifer, and Ellen was looking for ways to create blended learning courses of high quality and high standards so both our scholars and their institutions would see good value in our program. Our plan was to start slow so that we could carefully manage the design, facilitation, and instruction in the courses. We wanted to make sure that we were using a backward design course creation format so that we could ensure that our scholars were gaining usable skills along with post-graduate credits that they could put on their resume.

While Ellen and Jennifer started developing the first couple of courses, Kevin created another important relationship for us with the APS BEN Archive. Part of the archive is dedicated to a repository of teaching objects. These teaching objects are lesson plans that instructors can use in their courses to help teach particularly difficult concepts. The lesson plans were just what we needed as a culminating assignment for our HAPS Institute courses: they would include the A&P content that was learned in the course and would challenge instructors to think of different ways to teach these concepts in their own classes. Finally, these projects gave the scholars a published work that they could add to their resume.

The first couple of HAPS Institute courses really took off. Scholars loved the combination of deeper learning of concepts in A&P and finding ways to use them in their classrooms. After the first year, we began to expand our course offerings. We recruited master teachers to join us in providing courses for our scholars. Dee Silverthorn, Paul Kreiger, Kevin Petti, and Wanda Hargroder have all taught for HAPS-I. This has definitely helped us to keep up the quality and standard of our courses.

HAPS-I has grown rapidly! Because of this, we recently have created more structure in administering HAPS-I. Our new executive director, Larry Spraggs, will be helping us with the day to day administrative tasks. In addition, our new administration model includes Director Ellen Arnestad, Academic Affairs Coordinator Jennifer Lundmark, Instructional Design Coordinator Tom Lancraft, Assessment Coordinator Christine Martin, and a Marketing and Communications Coordinator position that has not yet been filled. Kevin Patton, Sandy Lewis, and Joe Griswold are all still heavily involved in HAPS Institute as advisors and are always there to lend a hand when necessary.

Now we need to determine where the demand for our courses is going to lead us. Larry is going to work with the committee to develop a strategic plan. That plan will guide us to grow in an organized and fiscally responsible way while continuing to provide high quality courses for our members.
I am pleased to report that Javni Mody was presented with the HAPS President’s Medal at the 2010 Annual Conference. This honor is awarded annually by the outgoing HAPS President to a member who demonstrates exceptional service to our organization. Javni was selected for this honor based on her work as our Marketing Manager. For the past five years, Javni has worked tirelessly as the “face of HAPS”, working with the vendors who support us at our conferences and throughout the year. Javni notes that she stays in this position because she enjoys the friendly relations that she has with all of our vendors — and, of course, she is one of the main reasons we have that friendly relationship! Prior to becoming our Marketing Manager, Javni was Regional Conference chair for three years, organized a regional conference in Baltimore in 2002, and served on the annual conference committee several times. You will also recognize Javni as a regular presenter of very popular workshops at the HAPS annual conference. This year she teamed up with Carol Veil to give a workshop on “Awesome Analogies, Dynamic Demos & Mnifty Mnemonics: Skeletal, Muscular & Nervous Systems.”

Javni is a tenured professor at Anne Arundel Community College (AACC) near Annapolis, MD. She has taught anatomy and physiology for 20 years, 13 of them at AACC. In 2007, the student association of AACC awarded Javni the Teaching Excellence Award — an award that goes to only one full-time faculty member annually.

The President’s Medal was established by outgoing President Sandy Lewis in 2006. Previous winners are Carl Shuster, Donna White, Kevin Patton, Susan Baxley, and Richard Faircloth. Note that Richard is also from AACC! That’s two years in a row that faculty from AACC have taken home the President’s Medal.

Congratulations, Javni, and thank you for your generosity, hard work, and dedication to HAPS!
HAPS in Review:  
Summary of Update Seminar #3:  
Motor Performance at Altitude: Influence of Cerebral Hypoxia

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Dr. Andrew Subudhi’s talk dealt with the always fascinating and geographically apropos question of how altitude-related hypoxia causes its effects on motor performance and exercise tolerance. He began by reminding us of both the history of altitude physiology studies in this area and the basic effects of altitude on partial pressure of oxygen, such that even though the air one breathes remains 21% O₂, a decrease in the barometric pressure (P bar) as one ascends a mountain means that PO₂ decreases significantly (PO₂ = P bar x %O₂). As P bar decreases, maximal O₂ uptake (VO₂max) also decreases; the human body is less able to use O₂ to perform aerobic exercise until at a P bar of 250 torr the body can only use about 25% as much O₂ as it could at sea level. Even slow walking feels like maximal effort.

But what body systems lead to this decrease in VO₂max? Historically, research searching for the ‘bottleneck’ in O₂ utilization has focused on the systems involved in oxygen uptake and transport (pulmonary diffusion, cardiac output, O₂ carrying capacity) and those involved in aerobic metabolism at the end-organ (muscle metabolism). There is evidence both for and against all of these systems. Dr. Subudhi, however, is interested in a previously unexplored factor – cerebral control of motor responses and the effect of cerebral hypoxia. Could the brain respond to hypoxia by shutting down motor systems?

Traditionally, the brain has not been considered in this research because it was unobservable. In Dr. Subudhi’s lab, brain oxygenation is observed by shining lasers in the near infrared (NIR) spectrum through the skull and measuring the light reflected back to a nearby sensor, in a method similar to the common pulse oximeter. Cerebral oxygenation can thus be measured in exercising subjects to see whether perceived exhaustion is related to cerebral hypoxia. Could the brain respond to hypoxia by shutting down motor systems?

Initial research did not support the hypothesis that the brain became sufficiently hypoxic to inhibit motor systems. Under normoxic conditions, cerebral oxygenation did not change much as subjects approached exhaustion. If anything, it increased slightly during moderate-intensity exercise and merely dropped back down to baseline level as subjects reached maximum effort. When subjects exercised under hypoxic conditions caused by breathing 12% O₂, cerebral oxygenation decreased continually as exercise intensity increased, demonstrating that the brain could tolerate greater levels of hypoxia than originally hypothesized. But it was unknown if the level of cerebral hypoxia induced by breathing low- O₂ air at maximal exertion approached a lower limit of tolerability which may have impaired motor drive or the motivation to continue exercising.

In the second set of experiments, subjects exercised in barometric chambers until they reached exhaustion (defined as a decrease in number of pedal revolutions/ min on an exercise ergometer). Cerebral oxygenation was measured throughout. As a second test of the hypothesis, subjects were given supplemental oxygen right as they reached the point of exhaustion. If cerebral hypoxia was the trigger for exercise intolerance, the supplemental oxygen should ‘restart’ the subject’s ability to exercise.

As expected, in normoxia subjects were able to exercise longer than in hypoxia. Supplemental oxygen had no effect in normoxia. However, it affected hypoxic subjects dramatically. It caused a 200% increase in cerebral oxygenation, a 30% increase in muscle oxygenation, and an immediate increase in exercise ability. The response was too quick to be due to changes in accumulated muscle metabolites or peripheral O₂ metabolism, supporting the cerebral oxygenation hypothesis.

Muscle fatigue is usually associated with an ~35% decrease in voluntary muscle activation with superimposed magnetic stimulation, and this was seen in normoxic and mildly hypoxic subjects both immediately before and after supplemental oxygen. These subjects’ muscles were as fatigued as their
decrease in exercise ability indicated. Severely hypoxic subjects, however, reached the limit of their ability to exercise while their muscles were still capable of quite strong twitches. Something other than leg muscle fatigue was blocking their ability to exercise. This factor, Dr. Subudhi believes, is cerebral hypoxia.

While NIR spectroscopy gives new data about what is happening in the brain, it also opens a new set of questions. The studies Dr. Subudhi discussed up to this point looked only at oxygenation in the frontal lobe. What is happening to oxygenation in other parts of the brain more directly associated with motor function? New data from his lab demonstrates that motor and premotor cortices’ oxygen levels appear to fluctuate with those of the frontal lobe under normoxic conditions, but during hypoxia the prefrontal cortex had lower O2 levels. In addition, NIR spectroscopy will only measure oxygen in the superficial cerebrum, so it leaves questions about the deeper parts of the motor circuitry unanswered. Isolating changes in brain oxygenation from changes in oxygenation to the rest of the body is an even greater challenge which will have to be met before it can be clearly demonstrated that the brain, and not some other system, is driving changes in exercise ability.

Dr. Subudhi’s talk offered something useful for almost any HAPS member’s physiology classes, from historical context and examples of new technology to a case study in experimental design and the difficulties of isolating specific systems when studying a complex, integrated response.

Editor’s Note: Dr. Subhudi has graciously allowed us to post the powerpoint of his presentation on the HAPS Website. [http://www.hapsweb.org/displayconvention.cfm?conventionnbr=7450](http://www.hapsweb.org/displayconvention.cfm?conventionnbr=7450)
Although we are life science professionals dedicated to teaching anatomy and physiology, many of us also have a great deal of interest in the arts. While at first blush these interests may seem polarized, the reality is that there is a natural connection between art and science. It is in the Medieval and Renaissance anatomy programs of Italy that this nexus is beautifully demonstrated. If you are planning a trip to the Italian peninsula, you can schedule a visit to several university museums that celebrate the rich cultural and artistic heritage of anatomy education.

In the summer of 2009 I had the opportunity to tour Italy and managed to arrange visits to several important venues in the history of anatomy education. It is the intention of this article to share my experience with the HAPS membership so that if any of you have an Italian adventure planned, you too can enjoy these sites. Incorporating these experiences into your lectures can add a dimension that engages your students in a unique fashion.

Florence

The Museum of Zoology and Natural History at the University of Florence resides within a building that is just south of the Arno and adjacent to Pitti Palace. This museum, also referred to as La Specola, dates back to 1775 and claims to be the first scientific museum in the world created for the public. It is an extensive facility with over 30 rooms, ten of which are dedicated to anatomic waxes. While the entire museum is of interest to any biologist, it is the waxes that are of appeal to the anatomist.

Although the oldest of the wax anatomical pieces dates as far back as the late 17th century, most were produced in the 18th century. The oldest and most important pieces were produced by Gaetano Giulio Zumbo (1656-1701), who is considered to be the pre-eminent anatomical wax artist. The vast majority of the specimens, however, were produced by Clemente Susini (1754-1814), who is regarded as the most famous and prolific anatomical wax sculptor of the Florentine school.

Over 500 wax anatomicals fill room after room with organs and limbs of incredible detail and accuracy. Most impressive, however, are the 26 whole body specimens. Many of the models can be dismantled and reassembled à la the modern plastic torsos in our present day laboratories. It is believed that due to the inability to preserve cadavers in that era, over 200 dissected human specimens were required to produce a single whole body figure.

Detailed knowledge of the exact process for the production of the wax figures has been lost. Historians believe, however, that the process started with dissected specimens that were sculpted as a crude model of wax or chalk. This model was cast in plaster, and these casts were used repeatedly as a kind of template for multiple models. Waxes, resins, and dyes of presently unknown composition, along with unique tools, were employed for the painstaking task of shaping the final product. The larger whole body figures were hollow and required supporting internal metal frames.

These anatomical waxes are an astonishing blend of art and science, and for those of you who enjoy an interest in both of these disciplines, you will find this collection to be visually arresting. The models are elegantly presented and scientifically accurate. Clearly they are the work of artisans who labored in concert with anatomists. This accuracy is rivaled only by the aesthetic beauty of the anatomical representation. The waxes at La Specola presently serve as testimony to the rich cultural heritage of our discipline, although they were initially produced for didactic purposes at medical schools in Florence and elsewhere in Europe.

Bologna

The University of Bologna, founded in 1088, is thought to be the oldest continually operating university in the world. Interestingly, the term "university" was coined at its foundation. From the perspective of the traveling anatomist, there are two locations of interest in Bologna: the Luigi Catania Anatomical Wax Museum and the historic Anatomy Theatre.

In a building within the university campus resides (Continued on next page)
the Luigi Catatonia Anatomical Wax Museum. While not as extensive in its collection as La Specola of Florence, this museum is nonetheless stunning. What distinguishes it is its collection of waxes depicting various anatomical variations and pathologies. If you are traveling with your family be advised of the graphic models of conjoined twins, small pox, and a multitude of facial deformities. There are also many natural bone specimens of these same conditions. A comfortable hall is nearby for those in your party who are not inclined to view the museum.

As soon as you enter the building, be sure to take a few moments to survey the over 2,000 human skulls on display in the Luigi Calori collection. A long corridor lined on both sides with glass cases displays skulls from various races and eras, as well as skulls that demonstrate myriad pathologies. Indeed, there are even skulls that date back to the ancient Romans. Perhaps the most breathtaking venue at the University of Bologna is the historic Anatomy Theatre. Several blocks from the wax museum, and proximal to downtown Bologna’s Piazza Maggiore, is the magnificent Palazzo dell’Archiginnasio. This palace was built in 1563 and was the first unified seat of the university. An anatomical theatre was constructed here by 1639 and functioned for almost two centuries. It was remodeled on several occasions and achieved its final configuration in 1736. The theater was almost destroyed during a Second World War air raid. Fortunately, it was reconstructed using the original pieces recovered from the rubble.

This entirely spruce wood theatre is complete with a cathedra for the professor and tiered seating for medical students. Above the cathedra, carved wooden statues of skinned bodies hold a canopy aloft. Central to the room is a white marble table for the human and animal dissections. Surrounding the room are statues of important figures in medical and anatomic education such as Hippocrates, Galen, and Mondino de Luizzi.

It is in this room that today’s anatomicist can truly feel a connection to the early European anatomicist. It is easy to envision yourself as a professor marching into this room about to perform a demonstration when it is filled with medical students and a fresh cadaver upon the marble slab. Imagine what it would be like to conduct a cadaveric dissection under the watchful eyes of not only your students, but of Galen.

Padua
A brief train ride from Venice is the historic university town of Padua (Padova). The university, perhaps the sixth oldest in the world, was founded in 1222 by students who left the University of Bologna in pursuit of greater academic freedom. Its eminent faculty and alumni include the likes of Andreas Vesalius, Gabriele Falloppio, Galileo Galilei, and William Harvey. The Anatomy Theatre at the University of Padua, built in
1594, is generally considered to be the oldest permanent anatomy theatre in the world. The Anatomy Theatre resides within the Palazzo Bo, the historic seat of the university.

A tour of the Anatomy Theatre should include a visit to several rooms and courtyards of historic importance at the Palazzo Bo. These include walls ornately decorated with the heraldic devices of alumni and faculty, as well as the Aula Magna (Great Hall). It is here that the university’s academic senate convened from the 15th to 18th centuries, and it is also where Galileo taught. His lecture podium still stands there today.

It is the Anatomy Theatre that will certainly be the highlight of your visit. It is here that a century and a half of Galenic anatomy progressively crumbled and was eventually replaced with the modern era. Six steep concentric balcony-like tiers with ornately carved wooden banisters surround a single dissecting table. Upwards of 200 students holding candles would lean against the rails and gaze downward at the cadaver as the professor demonstrated the dissection. It is amazing to consider that this is a room that witnessed William Harvey as a student. Was it here that Harvey first considered his nascent thoughts regarding the heart and circulatory system?

Rome

One final venue that bears mentioning is not associated with a university, but is likely to still be of interest to the anatomist who appreciates the connection between culture and science. Situated beneath the church of Santa Maria della Concezione die Cappuccini in a region of Rome between the Spanish Steps and Piazza Barberini is a surreal series of ossuary shrines. The bones of over 4,000 Capuchin friars who died as long as 500 years ago are intricately arranged in a total of six small shrines. Construction of the shrines began in 1631 when the friars relocated to this site. The bones are those of friars who were exhumed from the previous friary’s cemetery. In each of the shrines bones are piled high, nailed to the walls in elaborate patterns, and are even fashioned into light fixtures. Several shrines contain articulated skeletons, each donned in a Franciscan’s habit.

The Capuchin Crypt employs human anatomy to convey religious and cultural symbolism in a macabre artistic expression. The crypt however is more than just a morbid spectacle. It can be viewed through the prism of how the human body is a vehicle for expression on many levels: science, art, religion, and culture. Incorporating discussions of this remarkable catacomb into your presentations could initiate classroom conversations that go well beyond a normal anatomy lecture.

In Conclusion

A grand tour of Italy usually includes stops in Rome, Florence, and Venice, and involves visits to the most popular venues such as the Vatican, the Duomo, and Piazza San Marco. Exploring locations that go beyond the routine, however, can add a unique dimension to your experience. Anatomical wax museums, historic anatomy theaters, and artistic ossuary crypts are probably not of interest to the typical tourist, yet are intriguing to the traveling anatomist who has the inclination to connect art and science. These sites will speak to the many facets of your intellect, and could certainly be considered a professional development exercise. Consider incorporating the educational gems you will have mined from these places into your courses. It will add a depth and richness to your classes in the way a fresco adorns a Renaissance cathedral.

Selected references for further study:

Anatomy Theatre, University of Padua http://www.unipd.it/esterni/visiteweb/english/pagine/scheda12.htm

Capuchin Crypt, Rome http://www.cappucciniviaveneto.it/TheCrypt.htm


Luigi Catatonia Anatomical Wax Museum, University of Bologna http://www.iguidez.com/Bologna/the_luigi_cattaneo_anatomical_wax_museum/


Riva A. 2007. Flesh and Wax: Clemente Susini’s anatomical models in the University of Cagliari. Nuoro, Italy:Ilisso Edizioni

Ossuary shrine, Capuchin Crypt, Rome, Italy. Scan of a postcard purchased at the site.
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Long Eyelashes for Everyone?
The Clinical Impact of the Glaucoma Drug Bimatoprost on Eyelash Length and Darkness

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Have you ever wondered why eyelashes remain short while the hair on your head can grow to great lengths? If the length of the growth phase of eyelash hair could be increased, would short, sparse eyelashes become a thing of the past? Would you be willing to risk changing the color of your eyes as a tradeoff for longer eyelashes? Recent research indicates that the road to longer eyelashes may be opening up for consumer traffic but there may be a few potholes along the way.

Hair is an ancient feature of the mammals whose origin has been traced back 310 million years and linked to dinosaur claws through the production of keratin (Eckhart 2008). Structurally hair is a thin protein filament that grows from follicles located in the dermis of the skin. The development of hair follicles is believed to be highly conserved in evolution and follows a coordinated series of steps centered on complex epithelial-mesenchymal interactions (Phelpott 1999). Normally hair follicle formation is completed by week 22 of fetal development and no new hair follicles are added after that time. Humans have an estimated 5 million hair follicles dispersed over the body with approximately a million located on the head and only about 100,000 localized on the scalp. Though it often seems that hair becomes thinner as people reach adulthood, in fact as the body grows the skin increases in size along with everything else; consequently, there is an overall decrease in the density of hair follicles as growth to adulthood occurs but not a decrease in the actual numbers of follicles that are present (Ebling 1987; Martini 2009).

Once formed, follicles rotate through four phases that constitute their life cycle. A period of rapid hair growth, known as the anagen phase, is followed by a short intermediate period of follicular regression, known as the catagen phase. The catagen phase is followed by the telogen, or resting, phase. After the telogen phase hair is shed in the exogen phase. After shedding, the anagen growth phase starts over again. The anagen phase in scalp hair lasts from 3 to 4 years and occasionally for as long as 7 years in the case of hair that grows to the waist and longer. Shorter body hairs have correspondingly shorter anagen growth periods that are known to be specific for different body regions (Sperling 1991). The catagen phase lasts only 2 to 3 weeks and the telogen phase lasts for approximately 3 months. Eyelash hairs are specialized, fairly sturdy hairs that are protective in nature. Like all body hairs, they ultimately reach a definitive length determined by the amount of time they spend in the anagen phase of the hair growth cycle and the characteristics of the body site they occupy (Ebling 1987). A root hair plexus that triggers a blinking reflex when foreign objects come near the surface of the eye monitors each eyelash hair (Martini 2009). On a daily basis, 50 to 100 hairs are shed and replaced by growing anagen hairs. Anagen hair follicles are extremely metabolically active with mitotic rates second only to the blood forming tissues of the body. This intense metabolic activity helps to explain why hair is so sensitive to nutritional deprivation and chemical assault such as may result from chemotherapy (Sperling 1991).

The first ophthalmic prostaglandin for the treatment of glaucoma, a drug known as latanoprost, was introduced in 1996 under the trade name Xalatan. It reduced intraocular pressure of the eye by 25-36% and was followed by the introduction of a prostaglandin analog known as bimatoprost, sold under the trade name of Lumigan (Sharpe 2007). Several years ago in a classic case of scientific serendipity, doctors prescribing prostaglandin eye drops for their glaucoma patients and the patients themselves began anecdotally reporting an increase in eyelash thickness and length as glaucoma treatment progressed. Interest in this phenomenon was heightened in 2005 when the Jan Marini Skin Research group introduced an “eyelash growth enhancer” based on the active ingredient in glaucoma treatment eye drops. The FDA, questioning whether the product crossed the blurred line between cosmetics and drugs, confiscated the company reserves of the “Age Intervention Eyelash” product in 2006 but not before consumer interest had been kindled (Rundel 2007). Driven by consumer demand for eyelash “revitalizers,” several companies began to formulate eyelash treatment products that contained bimatoprost or a similar substance as an active ingredient and in December 2008, the FDA approved bimatoprost for cosmetic purposes, i.e. the darkening and thickening of eyelashes, in the treatment of hypotrichosis or eyelash loss. The first formulation to hit the market was a prescription product named Latisse® that was manufactured by Allergan, the company that gave us Botox (Latisse® 2010). Less expensive, non-

(Continued on next page)
hyperpigmentation around the eye has been noted in patients with glaucoma, as well as in the iris of patients with increased brown pigment. These changes are not uncommon and have been observed in both the eye and the eyelashes. The cause of this increased pigmentation is believed to be a result of the ability of bimatoprost to increase the total number of melanosomes around and within melanocytes, which is thought to be related to an observed increase in tyrosinase activity and/or to F Prostanoid receptor agonism.

Increased pigmentation in the iris of 30-40% and that as many as 70% of glaucoma patients overall may experience these color changes. The cause of the color change is not known at this time but it may be related to an observed increase in tyrosinase activity and/or to F Prostanoid receptor agonism. An increase in the color of the iris is not known at this time but it may be related to an observed increase in tyrosinase activity and/or to F Prostanoid receptor agonism. An increase in the color of the iris is not known at this time but it may be related to an observed increase in tyrosinase activity and/or to F Prostanoid receptor agonism.

Of all the eyelash re-growth products that are available commercially today, Latisse® is the most well studied and has been shown to increase eyelash darkness, thickness, and length. It has also been associated with eye dryness, redness, and irritation. In the world of beauty enhancement products where the consumer frequently seems to function as a guinea pig, it remains to be seen how widespread the market for eyelash enhancement products will ultimately be. Certainly manufacturers of these products will be searching for ways to reduce the most annoying side effects of their preparations even as they are already searching for the next generation of products that promise beauty and youth, often with a very high price tag and sometimes with troubling side effects.

References

Abramowicz M. (Editor in Chief) 2009. Bimatoprost 0.03% Solution (Latisse®) for Eyelash Enhancement. Medical Lett Drugs Ther 51(1313): 43-44.


hair keratin-like proteins suggests a new scenario for the evolutionary origin of hair. Proc Natl Acad Sci 105(47):18419-18423.


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Snippets – Quick Hints to Serious Demonstrations
A column that survives because you- the members- send in your Snippets
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EDU-Snippets is a column designed to let you, the members of HAPS, share your “ways to make sure your students get it.” 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. Quick and Easy Snippets

Three nifty ideas fitting this category crossed the EDU-Snippet desk this time. You might want to spend a little time playing with what our members have to offer and seeing how you can incorporate this material into your up and coming lesson plans.

A. Hematocrit Snippets

In January 2010 on the HAPS Internet discussion list, a question was raised about demonstrating possible hematocrit readings using nail polish. An interesting discussion ensued and two of the participants volunteered their ideas for a short squib on polished hematocrit Snippets.

Teri Trendler (Pasadena City College, tatrendler@gmail.com) uses nail polish for practical exams. Teri suggests making back-ups in case of breakage. Also, your colors may vary a bit.

The version of the nail polish/haematocrit experiment I do for practical exams is to paint the outside of the hematocrit tubes with different shades of polish. I start by filling the tubes with a clear (or slightly off-color clear) substance. Then I paint the bottoms of the tubes (to whatever height I want in order to demonstrate the hematocrit reading). I used red on the bottom for the rbc's and a relatively fine buff line for the buffy coat. The top part of the tube (with the uncolored or slightly colored liquid) I leave unpainted and this represents the plasma. If you start by standing tubes in hematocrit clay, you can paint them and then just leave them to dry. Students can easily measure the parts and calculate whatever hypothetical percentages you would like.

In response to Teri Trendler's idea, Robert Rawding (Gannon University, rawding001@gannon.edu) sent his version of doing practical hematocrit tubes for lab practicals.

For lab practicals, I do my own hematocrit immediately before the exam. I then enclose the hematocrit tube with two strips of wide clear tape. I trim these close to the ends of the hematocrit tube. This assures the tube’s safe handling. (I’ve used plastic hematocrit tubes for some time now). I require the students to take a reading to determine the hematocrit right during the exam. With the taped plastic tubes, there is little chance of breakage and, because I do the hematocrit myself, I know what the correct readings should be. When I need the tube again in a day or two, I stand the tube upright in a beaker and put it in the fridge.

B. Meiotic Snippet

We have all struggled with meiosis. Our students have too. Over the years this column has presented numerous great ideas for presenting meiosis in a logical and painless way. This is another of those interesting and hands-on takes on meiosis.

Tama Fox (South Seattle Community College, auntama@gmail.com) sent in an idea you can work with in your spare time (assuming you have any!!) or that you can have your own kids at home help you with. They might even get an idea to share at middle school or high school.

This demonstration of meiosis requires some stapling of Velcro strips (of varying colors) to pipe cleaners (also of varying colors). The pipe cleaners are chromosomes and the Velcro on pipe cleaners are centromeres.

Pre-assembly:
1. Attach a fuzzy 1 cm x 2 cm piece of Velcro (unhooked side) to pipe-cleaner “chromosomes” to make a centromere attachment site. A household stapler works well.
2. Use different colors of pipe-cleaners to represent different chromosome pairs, saving white for the spindle. (Chromosome I might be yellow. My “dad” pair would be yellow with sharpie stripes to (Continued on next page)
6. Assemble a “mitotic spindle” by stapling hooked 2 cm x 1 cm Velcro to the end of pipe cleaners. I use white pipe-cleaners for the spindle. Two spindle fibers are required for each chromosome pair to be pulled apart. (Twist the ends of the pipe-cleaners without Velcro together to make a microtubule organizing center.)

Demonstration:
1. “Replicate chromosomes” to create pairs of sister chromatids by attaching two pipe cleaners of the same color and pattern using the 1 cm x 2 cm area and staple together using a household stapler. Attach the pairs of “mom” and “dad” chromosome pipe-cleaners together. It is essential that this Velcro piece is weaker than the one holding sister chromatids together.

2. Attach “mom” and “dad” pairs of sister chromatids at centromere using the weaker hooked Velcro (0.5 cm x 1 cm), forming tetrads of homologous chromosomes. (Ensure a weaker hold.)

3. Show crossing over by trading a striped “dad” piece for an non-striped “mom” piece to make “modified dad” and “modified mom” pieces.

4. Attach a mitotic spindle pipe-cleaner to each chromosome pair at the fuzzy Velcro centromere.

5. The first “pull” (PMAT) separates “modified dad” from “modified mom” pairs, and completes meiosis I.

6. Reattach mitotic spindle to one of the resulting pairs of sister chromatids (eg. “modified dad”) for the second PMAT. The second pull separates “modified dad” chromatids.

7. Repeat for “modified mom”...

II. Snippets: To Talk or Not To Talk

(Continued on next page)
Tama Fox (South Seattle Community College, auntama@gmail.com) sent a long list of great ideas.

1. You can write a generalized time line on the board. If it is 4 PM and they all need to be at step Y in a series of X to Y to Z, cross out steps that “should be done right now” or put an arrow on steps they “should be at right now” (if they want to leave on time). Even if they are chattering, if you consistently do this time line all quarter or semester so that they expect it, they will know if they are talking too much without your having to be the “enforcer.” Remembering to keep this going during lab is the difficult part.

2. In lecture, if they start whispering too much, I stand there in total silence, pretending to be loitering while waiting for a bus. It may take 10 seconds or so until the silence becomes uncomfortable enough for them to stop whispering but eventually the social pressure is overwhelming and they do stop.

3. Another trick is to make them laugh by startling them – as long as it is safe to do so (no sharp implements or sensitive procedures). I have several squeaky toys that I squeeze in front of my microphone. I’ve even caused feedback noise on my microphone system by standing next to it on purpose. This works a max of once per term and they have to really be whispering because it is downright irritating. On rare occasions, I hide balloons in the desk up front that I pop. As soon as they are startled and I have their attention, we are off and running again.

4. It also helps to use positive attraction rather than negative distraction. In other words, attract students to the material rather than distract them from their unrelated material. That way you can come out with your usual enthusiasm rather than sounding like a parent.

Examples:

a. Call their attention to a projected photo or very short video that directly demonstrates something from the lab material.

b. Have individuals from groups directly relate the material to their own individual lives or life stories, or add a story of your own, group by group. This can also be done in writing as an instant mini-assignment.

c. Remind them what may be on a lab practical or lab quiz for that particular lab, group by group. (“Notice that…”, “I may ask if…”, “Can you find the…”, “Does this procedure help you understand why we…”, “Does this help you understand yesterday’s lecture on…”, and so forth.)

And finally, Elizabeth Harper (New York University, eh403@nyu.edu) sent in some ideas that she is trying. She says these tricks may not be well developed or well tested but that they do hold promise for dealing with the Chatty Kathy and Talkative Tim students you may have.

The behavioral issues go beyond teaching techniques, so I try……

1. Making certain my students eat before class (6-9pm on an empty stomach is too long). I remind them of this and suggest that if they have had nothing to eat that they grab a granola bar or something nutritious from the vending machine at break.

2. Making those who do chat aware of how it is affecting others’ concentration patterns and more importantly how chatting is affecting everyone’s grades.

3. Having students write a paragraph or two about a clinical topic related to the lecture. This is to be turned in before the lecture.

4. My sister who teaches 5th & 7th graders suggested that I (we) ask students to bring their IPods or such to wear in lab. This is to encourage work rather than chatting. The middle schools are finding this helps! Basic educational principles are the same regardless of academic level.

Editor’s note: More ideas on this topic are welcome!

III. Organelles – Snippet Style

Roberta Batorsky,(Middlesex County College, roberta.batorsky@gmail.com) holds a “Favorite Organelle or Structure Contest” for her community college students.

I have been delightedly surprised by the results and the creativity of my students, some of whom are working or parenting full-time (sometimes both) and taking classes! And, it is a good teaching tool to help them remember the organelles and structures.

The following is a modified example of what one student wrote. The student (Michael Mullen) has given permission for me to use it. I am certain your students will come up with some equally ingenious entries if you should decide to hold a “Favorite Organelle or Structure Contest.”

“My Desmosomes, you have me in your grip! I cannot tear myself away from you. Throughout the day I wonder why you are so attached to Cytoplasm, and yet I do understand the attraction you have for others. I think of you fondly for the bond that you share with your close knit community of neighboring cells. I do worry about possibly being afflicted with the blistering scandal of Pemphigus [an autoimmune disease of the skin]. It is not your fault that it is in your genes. I know full well that it is in your nature to resist the shearing forces of your life and that shall always bridge the chasm between us. Although you

(Continued on next page)
IV. Looping Intestinal Snippets

Another idea came across the EDU-Snippets desk – emanating once again from a discussion on the HAPS discussion list. Both contributors below have given their permission to discuss this further here in EDU-Snippets.

Our intestinal “problem” all began when John Moore (Parkland College, jmoore@parkland.edu) posted the following:

Does anyone have a good link to images showing embryonic gut tube rotation?? Good stills are fine, though animation would be fantastic. I can generally demonstrate this nicely in lecture by borrowing a vacuum cleaner hose from the custodial closet. If I get one that is too big, it looks like I’m fighting an anaconda – but it works.

Michael Pollock (Mount Royal University, mpollock@mtroyal.ca) explained his intestinal methods.

I used to do this in an embryology course, but rather than use a vacuum cleaner hose, I used two pieces of tubing – a narrow (maybe 1/2") yellow rubber tube to represent the small intestine and a piece of larger diameter black rubber tubing (selected so that the smaller tube would fit snugly inside). Using appropriate lengths of the two tubes allowed me to show not only gut rotation, but also how this rotation creates the large intestine ‘frame’ for the small intestine.

Shortly after the above exchange, Michael Pollock (Mount Royal University, mpollock@mtroyal.ca) sent this follow-up explanation directly to EDU-Snippets.

The small intestine is framed by the colon, and the reason for this three-sided frame is quite interesting. At about nine weeks, the gut begins to retract from the umbilicus, with loops of small intestine moving first; this motion is accompanied by a further 180° rotation (anticlockwise as viewed from the ventral side), with the result that the developing colon is rotated through a total of 270°, forming a three-sided frame around the coiled small intestine.

Students have difficulty visualizing this rotation and its effects, so I use rubber tubing to provide a demonstration. I use thin yellow tubing to represent the small intestine and thicker black tubing to represent the colon. I thread the thin tubing through my shirt so that it emerges at about my solar plexus; this holds the end in place so that I can hang on to the herniated loop. The thick tubing is tucked into the front of my trousers, to the general amusement of the students. I initially hold the loop out in front of me with the two legs one above the other, and then show the initial 90° rotation before retraction followed by the remaining rotation during gut retraction. If I coil up the yellow tubing as I retract and rotate the loop, the thick tubing automatically produces the ascending-transverse-descending pattern of the colonic frame.

While the division of the gut into small and large intestine is of most interest to students of anatomy, embryology students find the division into midgut and hindgut more useful. If the thicker tubing is used to represent the hindgut for such students, then the rotation and coiling has to be done carefully so that the thick tubing winds up representing the descending colon and the distal third of the transverse colon, with yellow tubing (midgut) representing small intestine, ascending colon, and the proximal two-thirds of the transverse colon. Because this is considerably more awkward and the colonic frame is less easily seen, I have found it necessary to practice this demonstration in front of a mirror before performing it for a class.

V. Incoming Idea (Future Snippet)

Johnny Lloyd (Aurora University, jilloyd@aurora.edu) sent in an idea 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!

A number of us then started talking about the various pros and cons regarding both written exams and oral exams. This could be part of the focus for the next column if any of you have any insights here. First, it would probably be a good idea to define the terms! Now, there is an idea! For instance, “oral exam” can cover anything from the instructor reading questions and the students writing the answers to the student pointing to the location of test items to the student explaining verbally how something does or does not work – and everything in between.

It is an intriguing topic and one that hopefully will stir some interest and some discussion out there in HAPS-land.

VI. 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! Keep in mind the two suggestions from this column – the idea of using the Snippets to argue the differences (pros and cons) between oral versus written exams, and the concern about dealing with the noisy students (Chatty Kathy or Talkative Tim) in your lecture or lab. If you have thoughts on either of these topics (or 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!
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The Committee Chairs invite input from HAPS members and
willingly provide information on the activities of their committees.