HAPSters enjoy the desert heat between workshops at Nevada State College.

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Leslie Samuel meets a new member in the Exhibit Hall.

Tom Lehman (President-Elect) showed up as a famous Vegas icon.

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HAPS ~ CONTENTS ~

From the Editors
And the Winner is…
President’s Medal to David L. Evans
By Dee Silverthorn, Past President...........................................5
The Sam Drogo Technology in the Classroom Award
2013 Recipient: Tom Lehman..................................................6
Las Vegas Scavenger Hunt
By Tom Lehman.................................................................7
Hapsters Participate in 1st Annual HAPS Foundation Poker Walk
By Bob Crocker.................................................................8
Scholarships ......................................................................9
First-Timer First Takes.........................................................10

Recaps and Reflections: Reflections on Conference Seminars
Update Speaker II: Process Oriented Guided Inquiry Learning
(POGIL): A Student Centered Approach to Science Instruction.
Speaker, Richard Mogg, PhD
By Murray Jensen..............................................................13

Update Seminar III Unraveling Mysteries of Hibernation: From Basic Science to
Biomedical Applications. Speaker, Hannah Carey, PhD
By David Evans...............................................................14

Update Seminar IV: Feeding our Beneficial Microbes: Pre-and Pro-Biotics and Gut
Health.
Speaker, Maria L. Marco
By Dr. Hiramya S. Roychowdhury.........................................14

Workshop Recap: Beyond the Microscope: In Pursuit of a More Lively Histology Class.
Presenter, Nina Zanetti
By Zoe Soon.................................................................18

Workshop Recap: Creating a 21st Century Learning Experience in Your Anatomy
Laboratory. Presenters, Ruth Heisler and Nora Hebert
By Zoe Soon.................................................................19

Workshop Reflection: Anatoma Italiana: The Medieval and Renaissance History of
Anatomy Along the Italian Peninsula. Presenter, Kevin Petti
By Ann Marie Froehle.......................................................19

Workshop Reflection: Creating Unique Active Learning Pre-class
Assignments to Help Students (and Instructors) Get the Most Out of Their Limited
Class Time Together. Presenter, John Runyeon
By Wends Riggs............................................................20

Workshop Reflection: Flipping Over Interactive Case Studies: How to ..........................20
Engage Students with Real-life Scenarios. Presenter, Cherie McKeever
By Wends Riggs............................................................20

Poster Recap: Assessing Background Knowledge for a Physical Therapy
Anatomy Course.
By Kathy A Starr PhD......................................................21

Get Social with HAPS........................................................23

Upcoming Events.............................................................24

EDu-Snippets
Practical and Innovative Ideas to Enliven Your Classroom
By Roberta Meehan........................................................43

Presentations Abstracts ....................................................46
Co-Editors and Committee Chairs - Sarah Cooper and Jennelle Malcos

Committee Members

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Jackie Carnegie
Elaine Chapman
Richelle Laiapply

Robert Meehan
Hiranya Roychowdhury
Brian Salisbury
Zoe Soon

Maria Squire
Kathy Starr
Nina Zanetti

The HAPS-EDucator is the official publication of the Human Anatomy and Physiology Society. As such, the HAPS-EDucator aims to foster the advancement of anatomy and physiology education by facilitating the collaboration of HAPS members through the publication of a quarterly journal. Journal articles may include, but are not limited to, those which discuss innovative teaching techniques (e.g., the use of technology in classrooms or active learning practices), original lesson plans or lab exercises, reviews of trending topics in anatomy and physiology, and summaries of newsworthy events such as seminars or conferences. All submitted articles will undergo a peer-review for Educational Scholarship. Articles not immediately accepted will be returned to authors with feedback and the opportunity to resubmit.

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The HAPS-EDucator publishes manuscripts consisting of original material that is not currently being considered for publication by another journal, website, or book and has not previously been published. Publication of the manuscript must be approved by all of the authors and have the approval of the appropriate institution(s). Manuscripts are to be submitted electronically to both editors: Sarah Cooper at cooperers@arcadia.edu and Jennelle Malcos at jmh608@psu.edu. Materials for Snippets should be submitted directly to Roberta Meehan at biology@ctos.com.

Formatting
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It is the responsibility of the author to make sure that the information on each reference is complete, accurate and properly formatted. References should be included in the body of the manuscript where appropriate using the following format: Author’s last name and date of publication, (Martini 2011). A list of ‘Literature Cited’ should appear at the end of the paper alphabetically by author’s last name. The following format should be used:

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Research that includes dissection and manipulation of animal tissues and organs must adhere to the Human Anatomy and Physiology Society (HAPS) Position Statement on Animal Use (Adopted July 28, 1995, modified January 2001, Approved April 29, 2012), which states that the use of biological specimens must be in strict compliance with federal legislation and the guidelines of the National Institutes of Health and the United States Department of Agriculture. The use of humans or animals in research must fulfill clearly defined educational objectives. http://wwwhapsweb.org/displaycommon.cfm?en=1&subarticlenbr=21 Experimental animals must be handled in accordance with the author’s institutional guidelines and informed consent must be obtained for studies on humans. It is the responsibility of the author(s) to secure IRB approval for research on humans.

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The editors will assign the manuscript to a minimum of 2 and a maximum of 4 members of the HAPS-EDucator editorial board for Educational Scholarship review. The reviewers will evaluate the manuscript for scientific accuracy, appropriateness to the audience, readability and grammar. The reviewers will submit their reports along with a recommendation that the manuscript be (a) published unaltered, (b) published with minor changes, (c) published with major changes or (d) not published at all. The editors will then decide what action will be taken with the manuscript and the author will be notified to prepare and submit a final copy of the manuscript with the changes suggested by the reviewers and agreed upon by the editors. Once the editors are satisfied with the final manuscript, the manuscript can be accepted for publication.

If the editors recommend rejection of the manuscript due to inappropriateness of its subject, lack of quality in its presentation or incorrectness of grammar or style, it will be rejected. If two reviewers recommend rejection of the manuscript made on the basis of inappropriateness of its subject, lack of quality in its presentation or incorrectness of grammar or style, it will be rejected.

The review process is single blinded which means that the reviewers know the identity of the authors of the manuscript but the authors do not have access to information regarding the identity of the reviewers.

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CONTACT THE HAPS-EDucator Editor:
hapsed@hapsweb.org

HAPS, PO Box 2945, LaGrange, GA 30241

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From the Editors

One of the anticipated events of HAPS is the annual conference. Anyone who has the opportunity to attend one of these conferences knows that it’s multiple days filled with academic information, teaching tips, the latest and greatest from vendors, action-packed workshops and, most importantly, time to meet new colleagues and catch-up with old friends. The annual conference in Las Vegas this year was no exception and over 600 HAPS member came together at the Mirage and Nevada State College to collaborate.

For those members of HAPS that can’t make it to the Annual Conference, we would like to share some of the highlights in a new Conference Edition of HAPS-Educator. In this edition we are introducing several columns relating to the conference: “First-Timer First Takes”, “The Winner is…”, and “Recaps and Reflections”. In “First-Timer First Takes” you can read about the personal experiences of a few of the 225 First-Time participants at the conference. “The Winner is…..” celebrates the various awards given to deserving members in a number of categories. Finally, “Recaps and Reflections” provides a insight to the activities (i.e., Update Speakers, Poster Presentation and Workshops) ranging from reviews to personal reflections. We are also happy to continue the great tradition of Edu-Snippets with a special conference column of Snippets inspired by events in Las Vegas.

At the end of this edition, you can also find abstracts of all the presentations at the conference. Spend some time perusing the content or using it for reference in the future. As always, we hope you enjoy this edition of HAPS-Educator and consider contributing an article in the future. See our webpage at: for more information on submissions.

Thanks,
Jennelle Malcos and Sarah Cooper
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Michael Mestan, D.C.
NYCC Executive Vice President of Academic Affairs

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President’s Medal to David L. Evans

By Dee Silverthorn
Past President

Professor David L. Evans from Pennsylvania College of Technology was awarded the 2013 President’s Medal at the annual meeting in Las Vegas, Nevada. Professor David L. Evans from Pennsylvania College of Technology was awarded the 2013 President’s Medal at the annual meeting in Las Vegas, Nevada. The President’s medal is an annual award that recognizes a HAPS member who has provided exemplary service to HAPS. The recipient is selected by the Board of Directors from nominations made by the membership.

David has been a member of HAPS for more than 20 years and during that time has been one of our most active members. At various times he has been our Public Affairs Officer and chair of the Public Affairs Committee as well as serving on the editorial board for the HAPS-Educator. He has served on the Web Committee, Nominating Committee, Marketing Committee, and the Distance Learning Task Force. David has attended most of our annual conferences and many of our regional meetings, and he has generously shared his knowledge with colleagues by presenting posters and workshops.

In recent years David has single-handedly been responsible for WHAT’S NEW IN A&P, one of the most popular features of our website. As editor of WHAT’S NEW he monitors comments on the listserve as well as news releases from a variety of sources, and each week he posts web links that provide up-to-date information on a variety of scientific topics for our members. It is for his largely unrecognized work with this feature that David was selected for this year’s President’s Medal.

Thanks, David, for all that you have done for HAPS through the years!
The Sam Drogo Technology in the Classroom Award

2013 Recipient: Tom Lehman

This award recognizes innovative use of technology to engage undergraduates in human anatomy and physiology. Award: Up to $500 to attend the HAPS annual conference. Award recipients are encouraged to conduct a workshop featuring technology in education innovations at the conference. Funded by ADInstruments.

Tom Lehman accepts the Sam Drogo Technology in the Classroom Award.
Las Vegas HAPS Scavenger Hunt

By Tom Lehman
Past Steering Committee Chairman, Current President Elect

During the annual HAPS conference, the Steering Committee likes to make a direct connection with First-Time participants. The Steering Committee (made up of the Chairs of the various committees in HAPS) hosts a Scavenger Hunt where First-Timers must track down each committee chair and gain their signature. Along the way, they learn about the different committees and how they can become involved. It’s an incredible activity that spans the first two days of the conference, helping First-Timers to meet many new HAPSters and learn more about the Society and what they can gain from it.

This is the eighth year of the Scavenger Hunt and we have had tremendous feedback about the activity. It’s a blast to see First-Timers from previous years help newcomers to find Chairs and integrate them into the great big family of HAPS. AD Instruments has been very generous in offering prizes each year for First-Time participants (if you look closely next time, you'll invariably see some HAPSters wearing caps from previous years). Of all of the participants who complete their Scavenger Hunt cards, one lucky winner receives free conference registration to the next year’s conference.

Congratulations to all of the First-Timers who successfully completed the Scavenger Hunt at the 2013 HAPS conference in Las Vegas! You demonstrated the enthusiasm and dedication that we like to see in our profession. We look forward to seeing each of you at Jacksonville in 2014!

Adeola Adesokan
Vivian AuBuchon
Sarah Balizan
Tynan Becker
Deanne Bell
Jennifer Burgoon
Theresa Cacek
Stephanie Carlson
Keely Cassidy
Joann Chang
Kwan Christenson
Anita Cliburn
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Michael Minardo
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Andrew Notebaert
Ozan Ozcan
Greg Pak
Ann Parsons
Terri Pope
Naureen Qasim
Melissa Quinn
Kazzara Raeborn
Amanda Rosenzner
Leslie Samuel
Julia Schmitz
Esther Siegfried
Angela Smith
Nanette Tamicek
Charity Tobeas
Justin Ulbright
Chad Wayne
Heather Wilson-Ashworth

Second prize goes to Mary Havrilla (Flintridge Sacred Heart Academy in La Canada, CA); a $25 Amazon.com gift card. The Grand prize goes to Melissa Quinn (Ohio State University in Columbus, OH), who won a free conference registration to next year’s HAPS conference in Jacksonville, Florida. Well done!
62 Hapsters Participate in the 1st Annual HAPS Foundation Poker Walk

Bob Crocker
Co-chair, HAPS Foundation Committee

Inspired by the Las Vegas locale of the 2013 Annual Conference, President Dee Silverthorn and President-Elect Valerie O’Loughlin organized a “Poker Walk” fundraiser to benefit the HAPS Foundation.

Sixty-two conference members participated. By making a modest donation, participants received a poker chip and were provided with a hint to where on “The Strip” they would find a HAPS volunteer who would give them another chip and another clue. Proceeding from one Vegas landmark to another, they finished back at the Mirage Hotel with five chips to trade for a poker hand. The best hands won great prizes donated for the cause, and everyone received at least a token gift to remind them of their Vegas visit.

The first prize winner was Charity Upton, who took home a set of Samsonite luggage. The Poker Walk was enjoyed by all who participated, and raised $830 for the HAPS Foundation. In all, the Foundation raised $3,000 from various events during the conference, making a significant contribution for grants and scholarships to be funded for the 2014 Annual Conference in Jacksonville.

Because of the continuing support and generosity of HAPS members, the Foundation was able to increase its principal balance to $38,000, enabling the Board of Directors to provide a record number of grants this past year:

- Three Robert Anthony Awards
- Two Adjunct Faculty Awards
- One Sam Drogo Technology Award
- Eight Graduate Travel Awards
- One Faculty Grant
- Two HAPS- I Scholarships

Thank you to all our Foundation donors

Please consider making a contribution to the Foundation. The recipients of all HAPS Foundation funding are deserving HAPS members. You can donate online at http://hapsweb.org/displaycommon.cfm?an=1&subarticlenbr=285.
**Scholarships**

**Robert Anthony Scholarship**  
2013 Recipients: Stephanie Bender, Brenda del Moral, Julia Schmitz  
This award encourages faculty during their first three (3) years of teaching anatomy and physiology to network with seasoned professionals by attending the HAPS annual conference. Award: Covers registration fee at the annual conference.

**Adjunct Faculty Scholarship**  
2013 Recipients: Tina Christianson, Wendy Riggs  
This award encourage adjunct (part-time) faculty during their first three (3) years of teaching anatomy and physiology to network with seasoned professionals by attending the HAPS annual conference. Award: Covers registration fee at the annual conference.

**HAPS Institute Scholarship**  
2013 Recipients: Amy Tice, April Murphy  
This grant provide financial support to instructors of anatomy and physiology who want to take a HAPS Institute course. Award: Covers one half of the tuition fee for one HAPS Institute course.

**Faculty Scholarship Grant**  
2013 Recipient: Karen Clark  
This grant is dedicated to proposals that integrate innovative and/or alternative pedagogy into existing instructional programs. Grant recipients are strongly encouraged to present their project results in the form of a workshop or poster session at the annual conference following completion of the project. Award: Up to $1500.

**HAPS Graduate Student/Postdoctoral Travel Award**  
2013 Winners: J. Bradley Barger, Lindsey Barone, Tynan Becker, Keeley Cassidy, Vi Nguyen, Meilssa Quinn  
Travel awards are given to graduate students or postdoctoral students to attend and present at the HAPS annual conference. Award: $400 cash and meeting registration waived. Funded by the HAPS Foundation.

---

**Learn How to Apply for an Award**  
Please see the “Grants & Awards” website for more information about each award and how to apply. Congratulations to all winners!
First-Timer First Takes
HAPS for High School Teachers

By Ann Marie Froehle
Cretin-Derham Hall High School, St. Paul Minnesota

In my first year working with Dr. Murray Jensen through the University of Minnesota College in the Schools Anatomy and Physiology program, he continually suggested we find professional organizations and “try them out.” He wanted us to be sharp, learn new things, and most importantly collaborate with others. As life moves quickly, I can honestly say I never got around to searching for--let alone joining--a professional organization.

Five years passed, and this year I was among the first handful of high school teachers attending a national HAPS conference. Of the more than 600 people in attendance in Las Vegas, about 225 were first-timers, and only 6 of us were high school teachers. Before the first night’s welcome reception, I had no idea how many people to expect. 100? 200? Would they all be heads of their departments? M.D.s? Ph.D.s? All from big universities? Would my colleague Jeff and I be the only high school teachers there? But most importantly, I wondered, would the other conference attendees see us as just high school teachers? And the answer to all of those was NO.

It was the most welcoming group of people I could have encountered. Even the president of HAPS greeted us warmly, and wanted to hear about our fabulous high school programs! I felt like I won the lottery in Vegas--I found people like me who not only teach anatomy, but absolutely love it, regardless of the age or level of the student. Building a network of colleagues was one of the things Dr. Jensen encouraged, and I found it at the conference.

There were a host of activities put on by HAPS: first-timers’ breakfast, receptions, a Poker Run (I’m in a walking boot, but I made that 5K “run”!), large sessions attended by the entire crowd, vendor presentations, I-Courses, and small workshop sessions. The sessions and workshops gave me many new ideas for things I’m going to add to my class for next year.

My favorite part of the conference was the time in between sessions, during which I met lots of new folks, including the other high school teachers! I can’t speak for the others, but I was at HAPS to learn if I was on the right track--Was I really preparing my students for an upper level A & P class? Was what I was teaching relevant? This was the perfect group of people with whom to discuss these questions.

I also met Peter English, who has started me on a new path in the HAPS organization. Peter and I started discussing what high school teachers desire from HAPS, and I’ve been nominated to be the coordinator for high school initiatives through HAPS. One of the benefits of HAPS membership is the listserv, which is open to all of the teachers, professors, doctors and collaborators. Peter has started a HAPS discussion board specifically for high school teachers that will be supported by input from our PhD / MD colleagues. This board will be a space to post a lesson idea, a great video, a place to get a wonderful lab set-up, and I’m sure many things we haven’t yet considered! We work with different parameters in the high school, and Peter is excited for HAPS to be a central place where we can find useful information, keep current on new science/technologies, and bounce ideas off people who may be a world apart.

I am exceptionally fortunate to work with Murray Jensen and 25 other high school teachers in the CIS program. We have built-in time for in-person collaboration through workshops two or three times per year, where we bounce ideas of one another, re-work labs to encourage student interaction, and discuss how to keep the bar set very high for our students. Murray knows we aren’t just high school anatomy teachers--we are preparing students for their college science courses and future health careers. Most of my 100 students come in thinking they are going to go into the health sciences. After finishing my course, only about half think they will continue that direction. I’m not discouraging them, I’m giving them a very difficult college level class that lets them know if they are ready for the rigors of a pre-med / nursing program or not.

I’m very excited to be a part of developing new opportunities for high school teachers through involvement with HAPS! We’re hoping to invite even more high school teachers to attend the Jacksonville conference in 2014—perHAPS this will be a way to promote awareness that even if you are in the middle of Montana or stuck in Hawaii, there are other A & P teachers who are excited to help you!

See you in Jacksonville!
My First HAPS Conference Experience

Jeff Adams
Pine City High School, Pine City, Minnesota

HAPS? What is HAPS? As a public high school teacher in rural Minnesota, I had no idea what HAPS was until I started teaching anatomy and physiology through the College in the Schools (CIS) dual enrollment program at the University of Minnesota. CIS 1135, Essentials of Human Anatomy and Physiology, is a course for non-major students and allows high school students the opportunity to earn college credit. Our CIS cohort, under the direction of Dr. Murray Jensen, was awarded a grant from UCare Minnesota to promote the education of healthy eating, exercise, and the dangers of diabetes, atherosclerosis, and obesity. As part of the UCare grant, our CIS 1135 students created informational kiosks to help educate members of their school and community on these topics. The kiosks have become a great outreach opportunity for our students. The UCare grant also provided me the opportunity to attend and present at the HAPS conference in Las Vegas.

As a ‘first-timer’ to the HAPS conference and being a high school teacher at a mostly higher education conference, I was not sure what to expect. However, when I left Las Vegas I was trying to figure out how I am going to get to Jacksonville next year.

One of the highlights of the conference for me was meeting and hearing Dr. Rick Moog present on POGIL. As a part of the CIS dual enrollment program, we have worked on writing anatomy and physiology POGIL curriculum, testing POGIL activities, and implementing the teamwork strategies that go along with the guided inquiry learning. Dr. Moog demonstrated how POGIL activities can be implemented even with LARGE groups. I am always looking at ways to enhance learning with my students and move away from lecture-style teaching, and POGIL activities have worked well with my students.

The breakout sessions at Nevada State College also provided me with ideas to bring back to my classroom. The variety of sessions from pedagogy, to content, to vendor demonstrations allowed there to be something for everybody. Since space was limited in some sessions many filled quickly, and “thank you” to those presenters who agreed to do a repeat of their sessions.

The speakers were informative and the sessions were practical. But the most important thing I brought back from the conference was the contacts I now have with other A & P instructors and HAPS members. I met with a small group of high school teachers who were first-timers, and we discussed ideas of what we do in class, how we can be more involved in HAPS, etc.

The First-timers Breakfast, the Welcoming Reception, and the Social Reception provided me with an opportunity to meet other educators and learn about their anatomy and physiology programs around the country. Some of the best staff development opportunities I have experienced have come from listening to what others do in their classrooms and laboratories in an informal setting. All HAPS attendees were very willing to share ideas, listen, and make this ‘first-timer’ feel welcome.
First HAPS Experience

By Ken Malachowsky
Florence-Darlington Technical College

This was my first HAPS meeting and it was AWESOME. The people were great and all the talks, posters, and workshops were very well organized and informative. The meeting has already impacted how I teach. Julia Schmitz presented a poster on the use of student made videos as an aid to learn A&P. I offered this option to my Summer microbiology students and some of them intend to make a video. POGIL was presented by Dr. Moog and Dr. Jensen. I have never heard of POGIL but I am already actively researching it and plan to introduce some POGIL activities into my Fall classes. I hope others do attend HAPS if they haven’t done so before. You will make new friends and definitely learn useful material that will enrich your courses.
Recaps and Reflections

Update Speaker II: Process Oriented Guided Inquiry Learning (POGIL): A Student-Centered Approach to Science Instruction

Speaker: Richard Moog, Ph.D.
Recapped and Reflections (The Next Step for Interested HAPS Members)
by Murray Jensen
University of Minnesota

It was hard to avoid Process Oriented Guided Inquiry Learning (POGIL) at HAPS this year. First, Dr. Rick Moog, Director of the POGIL Project, gave an informative and entertaining keynote presentation on Sunday morning that provided HAPSters a basic introduction to the teaching and learning method. Dr. Moog used a simple math activity to show how small group interaction can be directed through guided inquiry (the “GI” in POGIL) to develop and promote a conceptual understanding of a mathematical function. On Tuesday and Wednesday there were three workshops documenting the outcomes of a National Science Foundation sponsored POGIL project for entry-level anatomy and physiology programs. In that project, nine A & P instructors authored and tested a set of 15 activities that are currently in the pipeline for potential POGIL endorsement. During the workshops activities focused on, for example, the physiology of capillary exchange, and the determinants of blood oxygen content were demonstrated. (A complete list of the 15 activities, and more information on the NSF project can be found here: http://msjensen.cehd.umn.edu/POGIL/Brief_Intro.html)

It is difficult, but not impossible, to successfully implement POGIL activities without proper preparation, and attending a HAPS workshop is indeed a good first step. However, it is highly recommended that instructors who really wish to transform their classrooms attend a 3-day POGIL workshop. During these workshops, offered every summer in different regions of the US, instructors from multiple disciplines learn the many nuances of group learning and guided inquiry teaching techniques, e.g., assigning students to specific roles, strategies for promoting inquiry. (For more information on workshops go here: http://www.pogil.org/events or contact the POGIL office (pogil@pogil.org). We hope to offer more POGIL workshops at future HAPS conferences, but attending a 3 day workshop is highly recommended.

The 15 A & P activities authored by members of the National Science Foundation project, will eventually be published / posted on the HAPS Web site for all HAPS members to use as a benefit of membership. (They will be posted only after the POGIL Program has endorsed them.) One year after they have been posted, they will also be transferred to the APS Archive (http://www.apsarchive.org/) for even wider distribution.

Additionally, Dr. Patrick Brown, East Tennessee State University, has been working on a comprehensive collection of POGIL activities for a two-semester introductory A & P course. His collection, which will likely be published by Wiley, should be out sometime in 2014. Dr. Brown hopes to attend and possibly sponsor a workshop at the 2014 HAPS Conference in Jacksonville, Florida.

Richard Moog got the entire conference hall to participate in a POGIL exercise.

Murray Jensen and Patrick Brown share a smile at the conference

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Hibernation (or torpor) is usually thought of as a period of time when animal metabolism and temperature decline and is observed in a number of mammal species as well as certain other animals. Hibernation is not just a phenomenon found in creatures adapted to cold weather—the genes needed for hibernation have been discovered in all mammals. For example, the closest relative to humans that hibernates is the fat-tailed lemur, a species living in tropical Madagascar. Some species always undergo torpor (i.e. obligate hibernators) but others only under adverse conditions (i.e. facultative hibernators). Prof. Carey’s primary research was with the 13-lined ground squirrel, an obligate hibernator.

The speaker noted that there are actually wide variations in metabolic and organ activities during torpor. The physiological changes within the hibernating animal include: changes in weight and type of adipose tissue (white fat before torpor but brown during) and decreasing cardiac output, ventilation rate, hippocampal connections, gut permeability, and metabolic rate. The body temperature in hibernators normally falls; the arctic ground squirrel can go as low as -2.9° C. Dr. Carey and her colleagues noted that there are also plasma lipid changes during hibernation.

Amongst the major themes of her presentation were the changes taking place within the digestive system during hibernation. The microfauna are particularly challenged since they rely entirely upon their squirrel hosts and there is variation in species diversity comparing spring and winter. Study of the animals during torpor has helped to elucidate the development of the microbe-host relationship.

What practical value does Carey’s research have to human anatomy and physiology? As she pointed out, if torpor could be regularly induced in victims with ischemia or stroke (to provide two examples), hibernation might extend the window that practitioners have to address these insults. However, Dr. Carey also mentioned other applications such as organ preservation and work on reducing ischemia-reperfusion damage.

Further reading


Update seminar IV: Feeding our beneficial microbes: Pre- and pro-biotics and gut health

Speaker: Maria L Marco
Recapped by: Hiranya S. Roychowdhury
DACC-New Mexico State University, Las Cruces, NM.

Pick up any health-related journal or popular magazine, or simply type in a relevant search phrase on an internet search engine and you will be inundated with thousands of “hits” that talk about the importance of microbes in health. It is useful to look at the symbiosis between microbes and humans (animals) from the perspective of a practicing microbiologist. It was refreshing to listen to Dr. Maria Marco talk about gut microbiota with molecular data from rigorous investigation.

The talk was titled: “Feeding our beneficial microbes: Pre- and pro-biotics and gut health.” The concept of probiotics is not as “new-age” as one might imagine it to be. Indeed, Élie Metchnikoff, who shared the 1908 Nobel prize in Physiology and Medicine with Paul Ehrlich for their work on immunity, wrote...
Dr. Marco reminded the audience of the pervasiveness and diversity of microbes across the three major taxonomic groups: Eukarya, Bacteria and Archea. Six phyla of bacteria are dominant in the human body (Fig 1): Firmicutes, Bacteroidetes, Fusobacteria, Actinobacteria, Cyanobacteria, and Proteobacteria; and, as shown in Fig. 1, their distribution varies depending on the site (Spor et al., 2011).

Dr. Marco’ talk focused on the intestinal flora. To a general chuckle from the audience, she pointed out that given that there are hundreds of trillions of microbial cells – primarily bacterial – in our digestive tract, together with the population in other areas of our body each of us is only one percent human if one considers the number of genes involved. With that passing levity, Dr. Marco led the discussion towards some very thought-provoking studies she and her collaborators have been engaged in.

Of the four dominant bacterial phyla found in the in the gut (Firmicutes, Bacteroidetes, Actinobacteria and Proteobacteria) there are individual variations regarding the most dominant species. This means that each of us, depending on our exposures, end up harboring specific complement of microbes in our gut. It has been known for some time that our intestinal microbial population aid in several physiological processes like food digestion, energy capture, vitamin production, amino acid production, immunity and gut development. Subsequently, through molecular genetics employed in the study of colonic microbiota it has also become clear that the intestinal microbes play a significant role in maintenance of overall health of an individual. Obesity, chronic inflammatory diseases, allergies, diabetes, etc.

Over several decades, investigators have demonstrated the effect of long term dietary habits on gut flora of individuals. Over the last two decades, molecular biology tools have been steadily unfolding a vital link – where the intestinal microbial ecosystem serves as a symbiotically functioning “organ within an organ” (O’Hara & Shanahan, 2006). Certain strains of Lactobacillus and Bifidobacterium, commonly referred to as the “lactic acid bacteria,” constitute the main intestinal probiotics population. Certain strains of Lactobacillus are available from fermented food sources, like yogurt. Bifidobacterium is added to food by certain food manufacturers (e.g. Activia®). The predominant prebiotic ingredients in our food belong to the polysaccharide and oligosaccharide group that are expected to reach the colon intact and be selectively utilized by the colonic microflora. Therefore, non-digestible compounds, e.g. inulin, galacto-oligosaccharides, oligofructose, lactulose, etc., may be considered prebiotic.

Although familiar with the beneficial effects of probiotics in nutrition and their role in maintaining “healthy” colon environment, I was unfamiliar with the link between mental health and pre/probiotics. Dr. Marco mentioned a study where the investigators fed Lactobacillus rhamnosus to healthy mice and found discernible regional variations in the expression of the G-protein coupled GABA B1b receptor. When compared to the control group, the mice fed with the bacterium showed upregulation of this transcript in cortical regions (cingulate and pre-limbic) while the hippocampus, amygdala, and locus coeruleus nucleus showed lower rate of transcription from the same gene. As a result, the treated mice exhibited lower anxiety under stress (Bravo, et al., 2011). There are similar studies on effects of probiotics in preventing/alleviating aging-related and juvenile respiratory infections, atopic dermatitis, allergy symptoms, etc. It is now well documented, as pointed out by Dr. Marco, that the human gut microbiome also changes with age, showing marked alterations in an elderly when compared to young adults (Marathe et al., 2012; Yatsunenko et al., 2012).

Regular intake of resistant starch (RS; e.g. amylase) that escape pre-colon digestion has been shown to be

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highly beneficial in maintaining healthy gut flora. A recent study by Dr. Marco and her colleagues – using high throughput sequencing of 16S rRNA genes in genomic DNA extracts of cecal matter to quantify bacterial species – indicates that inclusion of RS causes the intestinal microbiome of aged mice (18 mo-old) to resemble that of younger animals, with higher proportion of Bacteroidetes, Actinobacteria, and Verrucomicrobia, while in mice fed with readily digestible amylopectin Firmicutes were the dominant phyla (Fig 2; Tachon, et al. 2013). The increase in bifidobacterial level in the mice observed as a consequence of RS rich diet also correlated with improved food intake (appetite) and the level of the Glucagon-Like Peptide, GLP-1. It is known that Bifidobacterial population remain steady in adults and then decline in elderly humans. The increase in the Akkermansia (phylum Verrucomicrobia) in 36% RS-fed mice also looks encouraging since this genus also declines in elderly humans and in patients with inflammatory bowel diseases.

Dr. Marco’s laboratory is specifically interested in the lactic acid bacteria (lactobacillus spp.). Lactobacilli are found in a wide range of niches of which the human body is one. While many Lactobacillus species are highly specialized, Lactobacillus plantarum show high degree of versatility in terms of colonization (meat, dairy, plants, human gut). Molecular and post-genomic tools have been used extensively in recent years for the characterization of this bacterium, making it the model organism for the study of lactic acid bacteria. By virtue of their versatility, the L. plantarum strains show extensive genomic heterogeneity hot spots depending on the isolates and, hence, adapt extremely well at their niche for specific functions as “natural metabolic engineers” (Siezen & van Hylckama Vlieg, 2011). Thus, each strain of L. plantarum is capable of exerting its own effect in terms of host-microbe interaction. One of the studies presented by Dr. Marco highlighted the diversity mentioned above. She and her collaborators evaluated 42 strains of L. plantarum, isolated from diverse sources, for their capacity to stimulate cytokine (IL-10 and IL-12) production in peripheral blood mononuclear cells. Utilizing comparative genome hybridization with microarray (aCGH), they identified six genetic loci with potential host immunomodulatory gene products (N-acetyl-glucosamine/galactosamine phosphotransferase system, the LamBDCA quorum sensing system, and components of the plantaricin (bacteriocin) biosynthesis and transport pathway). Given the diversity of the strains of Lactobacillus and the uniqueness of host-microbe interaction in human population, the challenge for any mode of probiotics delivery is in addressing this diversity. In other words, the emerging physiological paradigm of probiotics poses a challenge in having to tailor any probiotic delivery for therapeutic opportunities (fig 3). It is, therefore, perhaps expected that companies engaged in nutraceutical research will be looking at ways to ensure the best host-microbe match through careful genomic profiles. The work being done by Dr. Marco and her collaborators is paving the way towards that outcome.

The L. plantarum is the organism of choice for Dr. Marco for the reasons already mentioned above. Studies on the effect of diet (low fat “chow” versus high fat “western”) on L. plantarum gut colonization following a single dose of the probiotic were revealing. Whole genome transcriptional profiling using the WCFS1 strain showed marked differences in the overall proliferative capacity of the strain in mice alimentary tract (Fig 4). The propagative rate of L. plantarum – as observed in gnotobiotic animals in vivo – is much slower than what may be achieved in lab cultures. The transcription rates for housekeeping genes are also lower in vivo as expected. However, these same
housekeeping genes in chow-fed mice were expressed at the same level as in lab cultures grown on “chow broth” (Marco, M.L., et al. 2009). This suggested that the cecal environment in a chow-fed mouse would be similar to what can be provided under controlled in vitro condition for ideal microbial growth – another indication that diet dictates the microbial colonization of the gut. A natural extension of this work was followed by a very informative study on human gut flora. The human gut is colonized by *L. plantarum* 299V, which is closely related to the WCFS1 strain and, as a result, both are able to survive in the human intestine for extended periods of time. In a subsequent study, the group used a similar approach to investigate gene expression pattern in *L. plantarum* 299V from three colon cancer patients given fermented oatmeal drink containing the 299v strain for 8 days. RNA extracted from intestinal mucosa scrapings from the biopsy samples from these patients were subjected to expression analysis using WCFS1 microarray. When the data were compared with the gene expression data from the in vitro experiment (Marco et al. 2009), similarities in the upregulation of the transport systems, cell envelope- and cell wall-localized genes were observed (Fig. 5; and Marco, et al., 2010). Upregulation of the amino acid biosynthesis and central intermediary metabolism genes were observed in all three human subjects (Marco, et al., 2010).

Through all the studies on gut microflora, it is evident that probiotic and prebiotic support in the gut is important in maintaining not only digestive health, but also in the maintenance of overall health. Dr. Marco pointed out that while the exact link between the gut microbiota and the physiological processes is currently unclear, there is enough empirical evidence in support of the role of probiotics and prebiotics in maintenance of homeostasis and therefore in the prevention or treatment of some diseases. Dr. Marco and others, through direct evidence from human biopsy samples, have given us the direct insight into the ecology of the large intestine and into the microbial expression of specific genes. Genes involved in amino acid and carbohydrate metabolism (including carbohydrate uptake) were observed to be significantly induced *in vivo*. These pathways are undoubtedly relevant to the gut microbe adaptation and the microbial interactions within the intestinal ecology – especially when human alimentary canal is concerned, since, unlike that of a gnotobiotic mouse, a germ free environment cannot be expected therein.

From the well-presented seminar by Dr. Maria Marco, it was clear that while the research on probiotics/

prebiotics is a relatively new field, a substantial amount of knowledge has been gained over a short period of time – thanks to tremendous advances in the molecular tools since the late 20th century. These publications have given us a general idea regarding the potential mechanisms of actions of probiotics, which include: resistance to colonization by enteropathogens by "competitive exclusion" and perhaps through bacteriocin production, maintaining mucusosal tight junctions through signal transduction, and monitoring metabolic effects through pH modulation, quorum sensing and innate/adaptive immunomodulation (Fig 6; Sherman et al., 2009). It is also quite evident that several factors determine the efficacy of the probiotics. These include the strain of the microbe, delivery method, host-specific factors (age, genetics) and diet. The direct beneficial link between probiotics and the physiological processes will have to be established using soluble factors from individual microbes. Nonetheless, ultimately it would seem that diet is the only parameter under our control in ensuring a healthy gut ecosystem and proper homeostasis – offering a fresh perspective to the old adage: “We are what we eat.”

References:


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Workshop Recap – Beyond the Microscope: In Pursuit of a More Lively Histology Class.

Presented by Nina Zanetti
By Zoë Soon
University of British Columbia

Workshops were held over two days at the beautiful Nevada State College campus.

“Traditional histology labs are sometimes perceived as dull, partly because “normal” lab exercises in histology tend to be sedentary and observational, as compared to the active, experimental labs.” Dr. Zanetti shared some excellent ideas on how to make histology more exciting. The first involved making cell & organelle jello molds with cooked tube pasta to represent tubular structures and then slicing it to help illustrate how 3-D structures become 2-D structures under a microscope. Other ideas included: Histology Q&A flashcards, microscope scavenger hunts (e.g. On the microscope, find a _____, on the poster find a _____), clay structures (e.g. making a neuron, with cell body and dendrites out of clay, an axon out of pipecleaners, myelin sheath out of saran wrap). Hold a “Get Acquainted party”, by cutting up old anatomy atlases and creating everyday items that look like or have patterns resembling specific organelles, or cell types. Take pictures and display in a “Guess what this is” presentation for the class on the last day.

Other mini-productions might include protein conformation and endochondral bone ossification. Another great idea included “Off to the races” as a competition event between groups of students in putting a model together in the fastest time. Any type of contest was found to boost student engagement and enthusiasm. Examples of fantastic end-of-term bonus projects Included:

a) **Photography project** – find everyday items that look like or have patterns resembling specific organelles, or cell types. Take pictures and display in a “Guess what this is” presentation for the class on the last day.

b) **Children’s story** – create a cartoon or story that explains the physiology of part of any organ system.

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Another great suggestion was to take the “Histology Challenge” with your students! Every week a pathophysiologist (with surgeon) post slides of removed tissue on the HAPS website. Can you and your students guess what it is? Read the comments every day for more hints and answers are given every week. Case studies & pictures remain archived as well.

Workshop Recap – Creating a 21st Century Learning Experience in Your Anatomy Laboratory.

Presented by Ruth Heisler and Nora Hebert  
By Zoë Soon  
University of British Columbia

How can we ensure not only that students come to lab prepared, but also engage with lab materials in a meaningful way? Drs. Heisler and Hebert shared some excellent ideas with a standing-room only crowd. First they stressed the importance of: i) maximizing hands-on time in the lab; ii) providing accurate and clear assignments; and iii) teaching active study techniques (e.g., making flashsheets, which are similar to flashcards but with more information than just definitions).

To reduce instruction time and maximize hands-on time in the lab, online pre-lab assignments were included in the course, as were online pre-lecture quizzes (which consisted of 5 multiple choice questions). To further encourage learning outside the classroom, students were introduced to PAL (Practice Anatomy Lab, Pearson) for virtual dissections. When including online learning modules, clear instructions must be provided at the beginning of term and instructors should be prepared to support students who are not tech-savvy. Concerns about completing online assignments individually and independently were met by booking a nearby computer lab.

For increasing engagement and student-directed learning in the lab, the Jigsaw Method, developed by Elliot Aronson, was adopted for every lab. In the course design, the following parameters were implemented:

1. Lab Organization: Each student completes two 2-hour labs per week.
2. TA assignments: 2 TAs per lab section
3. Each student is assigned into a group of 4 students (this can be done randomly or by ability to ensure high and low achieving students are spread evenly).
4. Each student within the group is then assigned a role (A or B) for the entire term. There are two “A” students and 2 “B” students per group.
5. Each week, there are 2 major activities per lab. The “A” students are responsible for pre-reading Activity A, and the “B” students are responsible for pre-reading Activity B. They must complete pre-lab quizzes on their assigned Activity (A or B) prior to attending lab.
6. At the beginning of each lab, all the “A” students review Activity A with one TA, while all the “B” students review Activity B with the other TA. The TAs ensure that all the students know and can teach their activity to the other group members. The time for this is 30 min.
7. “A” Students must go back to their group of 4 and teach the “B” students Activity A. Then the “B” Students must teach the “A” students in their group, Activity B. The time for this is 1 hour.
8. TAs need to actively circulate and help throughout the lab.
9. TAs then check all the students knowledge prior to the end of lab through brief review Q&A session. The time for this is 20 min.
10. Students who wrote the Activity A pre-lab quiz then have access to the Activity B pre-lab quiz and vice versa.

The benefits of the Jigsaw Method lab are that students are completely engaged and come to lab prepared as they feel pressure to teach their peers. As students will need to get used to the Jigsaw Method in lab, it was recommended that this system should be used for every lab all term long. Students will remember that they are “A” or “B” students and can fall into a routine of preparing adequately before each lab. Another tip was to make sure that TAs are really familiar with the material and “buy in” to the method, providing accurate guidance and encouragement. As one might expect, when TAs just sit at the front reading or facebooking, everything falls apart.

Workshop Reflection - Anatomia Italiana: The Medieval and Renaissance History of Anatomy Along the Italian Peninsula.

Presented by Kevin Petti  
By Ann Marie Froehle  
Cretin-Derham Hall High School, St. Paul Minnesota

One highlight for me was attending a workshop by Dr. Kevin Petti called Anatomia Italiana in which he discussed the history of teaching anatomy and associations with famous artists. Not only is Kevin an amazing speaker, he showed me an appreciation for the science depicted in many famous paintings.
His talk included photographs from his many travels through Italy and visits to famous teaching landmarks, and demonstrated that true anatomical study was used to create many famous pieces of art. This was a very visual workshop and based on what he showed, I’ve ordered many posters for my classroom to give students a new perspective on learning anatomy!

**Workshop Reflection - Creating unique active learning pre-class assignments to help students (and instructors) get the most out of their limited class time together.**

**Presented by John Runyeon**  
By Wendy Riggs  
College of the Redwoods, Eureka, CA

I was totally excited by Jon Runyeon’s workshop about improving student preparation for lecture and lab. I’ve already made plans to incorporate the "External Brain" into my Human Anatomy class in the fall. The "External Brain" is an original work, produced by each student, that becomes a compilation of the content learned during the course. Students are given “External Brain” assignments to complete before coming to class, and they are utterly motivated to do a fantastic job because they are actually allowed to use their “External Brains” on a portion of each exam! While I am planning to have students create an External Brain next semester, I am a little worried about designing good “External Brain” assignments, but my students tend to be flexible humans and I’m sure they will help me come up with good ideas as we go. I am more worried about writing assessment questions that are challenging enough to warrant the use of an open-External Brain. I was also really inspired by Runyeon’s grading policies, which essentially allowed students to master content at any stage of the course and earn the grade they desired. Toward this end, he had several grading schemes that varied the weighting on each of the COMPREHENSIVE course exams. This allows students to demonstrate their understanding of the course content at any stage of the game. I loved this idea because it allowed students more flexibility to master the massive quantities of material in a Human Anatomy course.

**Workshop Reflection - Flipping Over Interactive Case Studies: How to engage students with real-life scenarios.**

**Presented by Cherie McKeever**  
By Wendy Riggs  
College of the Redwoods, Eureka, CA

I loved the workshop on Interactive Case Studies by Cherie McKeever of Great Falls College in Montana. McKeever started the workshop with a video of the FUN she has teaching A&P at Great Falls College and this theme was reiterated throughout the entire workshop, because McKeever believes learning should be FUN. Attendees participated in a case study that involved some very entertaining and unique additions to the traditional approach. First, each student group had a real “patient”, which was one member of the group. The “patients” were given an information sheet that outlined basic information they were to reveal to the rest of the group, but only after being asked appropriate questions. During the workshop, we actually participated in two different cases. In one scenario, after evaluating the patient, we were allowed to order two of three possible tests. We had to decide which tests were probably the most relevant and then we had to interpret the results. I loved how the case became much more interesting and engaging with such subtle adjustments. Throughout the workshop, McKeever emphasized making the cases as fun as possible. Toward this end, she always encouraged the use of props and high quality acting skills. She describe one case she used in which an “eviscerated” patient covered her abdomen with bratwurst and ketchup! Fantastic! McKeever also revealed that she offers a summer online course, through Great Falls College, geared toward helping folks develop their own case studies. I’m so tempted to sign up.
Prior to entering the Doctor of Physical Therapy (DPT) program at Western Carolina University students are required to successfully complete 6-8 semesters hours of human anatomy and physiology either as individual courses or as a combined A&P course sequence. A Background Knowledge Probe (Angelo and Cross 1993) was administered to incoming students to assess whether they had the foundational knowledge necessary for successful completion of the physical therapy department human anatomy course (PT 821).

The course instructor created the Background Knowledge Probe by first compiling a list of essential information based on a review of curricular materials for PT 821. The probe consisted of 62 questions (multiple-choice, fill-ins, true/false) with answers verified using current A&P textbooks to insure accuracy and to be consistent with the way in which the information is presented in undergraduate A&P courses. As part of the probe, students were asked to assess their preparation for anatomy. This research was approved by the WCU Internal Review Board.

The probe was administered on the second day of class fall 2012 to all physical therapy students (n = 32) enrolled in PT 821. Students were informed that performance on the probe in no way affected their grade in the course. Data were also collected from admissions applications to determine variables that might influence a student’s background knowledge. Students enrolled in PT 821 were 72% females and 28% males ranging in age from 21 to 43. Most students (41%) had degrees in movement sciences/sports but majors in biology, psychology and health related fields were also common.

The mean percentage score on the probe was 69% (SD = 9.016%, n=32). When asked how they perceived their anatomy background before entering the DPT program 66% of students felt their background was adequate but with some areas of weakness. The relationship between mean scores on the background probe and students’ perceptions of their background were examined using Spearman’s rho with alpha set at 0.5, one tailed. There was a significant positive correlation (rs(32)=.334, p=.031) between performance on the probe and student perceptions. There was no significant difference in performance on the probe based on where the last A&P course was completed (81% completed at college/university vs. 19% at community college). A Pearson correlation coefficient calculated for the relationship between the amount of elapsed time since completing the last A&P course and mean percentage score on the probe revealed a significant negative correlation (r(31) = -.398 p<.05). Students tended to perform more poorly on the probe with greater time span since completing the last A&P course. One student with an advanced degree was excluded from the time lapse analysis.

When asked about their A&P background students felt weakest in topics related to the integumentary system, nervous system and cell biology/histology. This was reflected in their performance in these topics on the probe (61%, 59% and 50% respectively). Course content in PT 821 will be modified to include review materials that address these areas.

The sample size (n=32) for this study was small and limited to the number of students enrolled in PT 821 fall semester 2012. The instructor plans to continue data collection with future classes. Additionally, the probe will be administered at the end of the course as a post test to help determine if areas of weakness in background information have been eliminated. Angelo TA, Cross KP. 1993. Classroom Assessment Techniques. San Francisco (CA): Jossey-Bass Publishers, p.63-65.
announcing...

HAPS SOUTHERN REGIONAL

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Now accepting proposals for HAPningS
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Comfort Inn and Suites
5825 Quebec Street
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817-237-2300 (Ask for HAPS rate)
$79/night; included free breakfast
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We look forward to seeing you there.
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And even watch a compilation of events from the Annual Conference on YOUTUBE:
http://www.youtube.com/watch?v=TMCXZJG8e20
Created by Jason LaPres, Southern Regional Director
**Upcoming Events**

**HAPS 2014 Annual Conference**  
Jacksonville Florida  
Find all the information you need at the Annual Conference website:  
[https://m360.hapsweb.org/event.aspx?eventID=79972](https://m360.hapsweb.org/event.aspx?eventID=79972)

**Southern HAPS Conference**  
By Janice Yoder Smith  
Consider coming to our regional conference at Tarrant County College Northwest Campus in Fort Worth, TX on Saturday, Nov. 2nd.  
HAPS’ very own Dee Silverthorn will present a seminar on epithelial transport and C. Munro Cullum will present one on sports concussions.  
Jason LaPres will be teaching two HAPS-I courses: one on Saturday, 11/2, about current topics in A&P and the other on Sunday, Nov. 3rd on respiratory system anatomy and physiology.  
Complete details for the HAPS-I courses can be found at [http://hapsweb.org/displaycommon.cfm?an=1&subarticlenbr=384](http://hapsweb.org/displaycommon.cfm?an=1&subarticlenbr=384)

To have a successful conference, we need your help. We have a brand new event called HAPningS that allows those of us afraid to start with a full hour workshop to share a good idea with other HAPSters in 10 minutes.  
Think of these short workshops as speed dating or speed professional development.  
Come on! Try doing one! You can sign up to do a HAPning at [https://docs.google.com/forms/d/1_d6W77ZkjFyY1sgDfA0BjTfy1U6g8pKKiCe3CS1t_FSU/viewform](https://docs.google.com/forms/d/1_d6W77ZkjFyY1sgDfA0BjTfy1U6g8pKKiCe3CS1t_FSU/viewform)

We also need your help with the more traditional workshops. If you have thought about doing a workshop at the annual HAPS conference but were a bit too anxious to start with an international audience, a regional conference is a great place for you to try your wings.  
You can sign up to present workshops here:  
[https://docs.google.com/forms/d/1cDYS50aR-KQ7IPcg3LKYlbku2Vgbd_7k3mpb2JoQ1EU/viewform](https://docs.google.com/forms/d/1cDYS50aR-KQ7IPcg3LKYlbku2Vgbd_7k3mpb2JoQ1EU/viewform)

If you come to the regional from outside the DFW metroplex and need a place to stay, we have some rooms reserved at the Comfort Suites at 5825 Quebec St, Lake Worth, TX 76135, just 3.7 miles or 10 minutes from NW Campus. Just call Comfort Suites at 817-237-2300 and make a reservations for a HAPS room. Rooms are $79/night.  
Many of you from TX colleges will be eligible for state hotel tax exemptions.

We look forward to seeing you Nov. 2nd.  We’ll likely have temperatures ranging from around 55F for a low and 75F for a high then.  
It should be a great day!

**Regional HAPS Conference in Minnesota**  
By Murray Jensen, University of Minnesota

Though it is over a year away, plans are being made for the October 17 and 18 2014 Regional HAPS Conference in Minnesota.  
The focus of the conference will be on high school A & P educators, but all A & P educators are welcome.  
At this time organizers of the conference hope to offer three different session tracks:

1. **Teaching and Learning A & P**  
Example subtopics: cooperative quizzes, POGIL, case studies, experiential learning projects.

2. **STEM and A & P**  
Example subtopics: history of medical devices (e.g., pacemakers), engineering and A & P labs.

3. **Anatomy and Physiology Content Update**  
Example subtopics: the physiology of muscle fatigue, imaging in A & P, mechanisms of common diseases.

The site for the 2014 conference will be Eastview High School which is located about 20 minutes south of Minneapolis/St Paul airport and 15 minutes away from The Mall of America. It is close to many hotels and restaurants.  
Eastview is a large suburban school with ample room for workshops and plenary session.  
The school’s Principal has been very generous in offering us full access to the labs, open spaces, and even the auditoriums within the school.

High school educators have typically not attended HAPS meetings, and we hope this conference proves to be a beginning point for many more program endeavors.  
One reason for HAPS to be interested in high school programs is the rapid rise of dual, or “concurrent,” enrollment programs which allow entry-level college courses to be offered within highs schools, and for which high school students can earn college credit.  
(Much more information on concurrent enrollment can be found at the web site for the National Alliance of Concurrent Enrollment Partnerships:  
[http://nacep.org/about/what-is-concurrent-enrollment/](http://nacep.org/about/what-is-concurrent-enrollment/) )

Much more information on the 2014 Fall Regional Conference will be posted on the HAPS web site and offered at the National HAPS Meeting in Jacksonville in May, 2014.
Update Seminar 1: Extreme Makeover - Anatomy Edition: How a paradigm shift in pedagogy re-built and retooled anatomy into an essential clinical science at a medical school and undergraduate institution
Sponsored by American Association of Anatomists

Jonathan J. Wisco, Ph.D.
Assistant Professor of Pathology and Laboratory Medicine
Brigham Young University, Provo, UT jjwisco@gmail.com http://faculty.pathology.ucla.edu/institution/personnel?personnel_id=212287

Abstract: Much has been said about, and speculated on, the effect medical sciences curriculum changes have had, and will continue to have, on gross anatomy pedagogy. In the ten years since major curriculum change was implemented at the David Geffen School of Medicine at UCLA, gross (and microscopic) anatomy pedagogy have transformed from isolated courses into themes integrated into systems based units. Although administrative policies provided the initial impetus for pedagogical transformation, in recent years, incorporation of clinical instructors into the laboratory experience has fostered multi-disciplinary teaching partnerships that provide contextual learning experiences for students. The paradigm shift from dissection to prosection pedagogy, the integration of clinically relevant anatomy through radiology and acute care, the development of interactive, online learning tools, and an upgrade in classroom technology have influenced our ability to provide advanced anatomical sciences instruction throughout all four years of undergraduate medical education. At Brigham Young University, we are scaling the best, most salient elements of anatomical sciences education at UCLA to an undergraduate anatomy program that serves nearly 2000 students per year. This year we are implementing a modified Problem Based Learning paradigm to several of our lecture sections of 200 students each, and using social media to encourage discussions during and outside of class time. We discuss our experiences of pedagogy transformation at UCLA and BYU and our vision for moving forward with anatomical sciences education.

Biography: Jonathan J. Wisco, PhD is Associate Professor in the Department of Physiology and Developmental Biology, and in the Neuroscience Center, at Brigham Young University (BYU). He is also Adjunct Associate Professor in the Division of Integrative Anatomy, Department of Pathology and Laboratory Medicine, David Geffen School of Medicine at UCLA. He is Director of the Laboratory for Translational Anatomy of Degenerative Diseases and Developmental Disorders at both BYU and UCLA.

Dr. Wisco completed his predoctoral training with Dr. Douglas Rosene in the Laboratory for Cognitive Neurobiology, Department of Anatomy and Neurobiology, Boston University School of Medicine. While there he also trained in the disciplines of anatomy, histology, neuroscience, embryology, neuropharmacology and cell biology. Dr. Wisco then completed a postdoctoral fellowship in radiology with Dr. Gregory Sorensen at the Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital/Harvard University/Massachusetts Institute of Technology. He currently serves in various capacities with the American Association of Clinical Anatomists, American Association of Anatomists, and International Association of Medical Science Educators. Dr. Wisco is the recipient of three Golden Apple Awards for Teaching Excellence by the UCLA Chapter of the American Medical Student Association in 2008, 2009 and 2011. He also received PBL Tutor of Excellence recognition at UCLA from 2006-2012. He is the 2013 recipient of the American Association of Anatomists Basmajian Award. In addition, Dr. Wisco has published in Proceedings of the National Academy of Sciences, Philosophical Transactions of the Royal Society, Annals of Neurology, and other journals for the disciplines of clinical anatomy, neuroscience, radiology, psychiatry, anesthesia, cardiology, head and neck surgery, and anatomy education.

Dr. Wisco’s research interests include histological validation of imaging biomarkers for Alzheimer’s disease, anatomical validation of new surgical and radiological procedures, and improving anatomy education for medical students. In addition, Dr. Wisco directs Anatomy Academy, an elementary school outreach and research program that teaches
anatomy, physiology and nutrition concepts to 5th grade students as part of their physical education program in Los Angeles, CA and Salt Lake City, UT schools. The program is integrated with language arts to encourage self-reflection on health issues. Anatomy Academy aims to combat the obesity epidemic through educational intervention, and is a multi- institutional and multi-disciplinary collaboration between the disciplines of medicine, dentistry, nursing, public health, public policy and education.

**Update Speaker II: Process Oriented Guided Inquiry Learning (POGIL): A Student- Centered Approach to Science Instruction**

Sponsored by POGIL (Process-oriented guided inquiry learning)

Richard Moog, Ph.D.
POGIL Project Director Lancaster, PA Rick.moog@fandm.edu http://www.pogil.org/contact/pogil-team/national-office/moog

**Abstract:** Process Oriented Guided Inquiry Learning (POGIL) is a student-centered group learning approach to science instruction based on research on how students learn best. In a POGIL learning environment, students work in small groups using specially designed activities that guide them to construct key concepts and deepen their conceptual understanding of that content. At the same time, the POGIL learning environment is designed to consciously promote important process skills such as teamwork, problem solving, and critical thinking. POGIL approaches have been widely implemented in a variety of science courses at both the high school and college levels. This presentation will provide insight into the fundamental principles of POGIL and will include presentation of student outcome data concerning POGIL’s effectiveness.

**Biography:** Rick has a B.A in chemistry from Williams College and a Ph.D. in physical chemistry from Stanford University. He is currently Professor of Chemistry at Franklin & Marshall College. He is the both a Principal Investigator and Project Director for The POGIL Project and the Project Coordinator for the Middle Atlantic Discovery Chemistry Project (MADCP). Rick has been using a guided inquiry approach to teaching chemistry since 1994, and is the co-author of POGIL materials for general chemistry and physical chemistry. In addition, he has developed guided inquiry experiments for use in the general chemistry laboratory. He has organized numerous symposia at national ACS and BCCE meetings concerning POGIL (and active learning more generally) throughout the chemistry curriculum, and has given dozens of presentations, posters, and workshops on POGIL. He is also coauthor of several journal articles and book chapters concerning POGIL, and the co-editor of the

**ACS Symposium Series volume: Process Oriented Guided Inquiry Learning.**

**Update Seminar III: Unraveling Mysteries of Hibernation: From Basic Science to Biomedical Applications**

Sponsored by American Physiological Society

Hannah Carey, Ph.D.
University of Wisconsin – School of Vet Med
Department of Comparative Biosciences careyh@svm.vetmed.wisc.edu http://www.vetmed.wisc.edu/people/careyh/

**Abstract:** Hibernation in mammals is a dynamic period characterized by extreme fluctuations in body temperature, metabolism and organ function as animals cycle into and out of the torpid state. This presentation will describe the features that characterize the annual hibernation cycle in mammals, and its potential to produce novel insights into both basic animal biology and biomedicine. Hibernating mammals fatten during the summer months, then cease feeding as winter approaches and their physiology shifts to a primarily lipid-based metabolism. In response to the winter fast, the gastrointestinal tract undergoes substantial atrophy which conserves energy and protein stores, yet it retains the cellular machinery to digest and absorb nutrients. The gut lumen is also home to trillions of microbes that have complex, mutualistic relationships that benefit both members of the symbiosis. To meet their metabolic needs, most gut microbes rely on dietary components that escape digestion and to a lesser extent, endogenous substrates such as nutrients in shed epithelial cells and mucus. Host diet is thus a major factor that regulates the diversity and abundance of the microbiota. Hibernating mammals provide a unique perspective on the evolution of host-gut microbial symbioses because of their natural cycles of extreme dietary change. Hibernators also have remarkable resistance to injury in experimental models of stress and trauma, including cold and warm ischemia-reperfusion injury, and hemorrhagic shock. Studies in the Carey laboratory and others around the world are working to unravel the mechanisms responsible for hibernation-induced stress resistance, and translate that knowledge to medical applications that help humans and other animals.

**Biography:** Hannah Carey is a Professor in the Department of Comparative Biosciences at the University of Wisconsin School of Veterinary Medicine. She received her undergraduate degree in Biological Sciences at the State University of New York at Binghamton, and her Ph.D. degree in Zoology from the University of California, Davis. Dr. Carey’s doctoral dissertation research was carried out at the University of California’s White Mountain Research Station, where

(Continued on next page)
Interactions in the mammalian intestine. We have observed that diet influences host-microbe and microbe-microbe interactions to elucidate the mechanisms that determine how dietary probiotic bacteria offer unique opportunities associated with the gut microbes. Prebiotic carbohydrates and dietary probiotics alter the physiological and immunomodulatory effects conferred by bacteria in the intestine. Our findings show that diet and specific dietary components (e.g., prebiotics) alter the physiological and immunomodulatory effects conferred by bacteria in the intestine. Outcomes of this work are important for improved clinical approaches and food products designed to optimize benefits to human health.

**Biography:** Maria Marco is an Assistant Professor in the Department of Food Science & Technology at The University of California, Davis. She received her BS in microbiology from The Pennsylvania State University and PhD studying plant-microbe interactions at The University of California, Berkeley. She then worked as postdoc and research scientist leading fundamental and applied research for the food industry at NIZO food research and TI Food & Nutrition, The Netherlands. Her laboratory at UC Davis is focused on the genetics, ecology, and host-microbe interactions of lactic acid bacteria in food systems and the human digestive tract. The broad objective of her lab is to understand the mechanisms by which beneficial microbes improve foods and human health. Her work is funded by federal and state agencies and she is collaborating with domestic and international food companies on topics related to food safety, food production, and gut health.

**Update Seminar V: Molecular Targeted therapy in hematological malignancies**

**Ayalew Tefferi, M.D.**
Professor, Hematology and Oncology Mayo Clinic.
Rochester, MN Tefferi.Ayalew@mayo.edu http://mayoresearch.mayo.edu/staff/tefferi_a.cfm

**Abstract:** The talk will include overview of advances in the molecular pathogenesis of hematological malignancies and identification of molecular drug targets.

**Biography:** Ayalew Tefferi, MD was born in Addis Ababa, Ethiopia and migrated to the United States in 1982 after completing his medical school education at the University of Athens in Greece. Dr Tefferi received his hematology training at the Mayo Clinic in Rochester, Minnesota before joining the staff at the Mayo Clinic College of Medicine, division of hematology in the department of medicine. He is currently a full professor in hematology and internal medicine. Dr Tefferi is primarily engaged in direct patient care. His clinical and laboratory interests focus on myeloid disorders including polycythemia vera, essential thrombocythemia, myelofibrosis, chronic myeloid leukemia, myelodysplastic syndrome, acute leukemia, and the atypical myeloproliferative disorders including hypereosinophilic syndrome and (Continued on next page)
systemic mastocytosis. His academic and research achievements have been copious and include over 800 publications including books, book chapters, original articles, reviews, editorials, letters, and abstracts. Dr. Tefferi serves as an associate or section editor for the Mayo Clinic Proceedings, Leukemia, American Journal of Hematology, and European Journal of Hematology. He also participates in the editorial board of several journals including Blood, Cancer, Leukemia Research, Acta Haematologica, and Leukemia and Lymphoma. Dr. Tefferi has given more than 500 national and international invited lectureships and serves as faculty for the annual Hematology and Oncology Board review courses at George Washington University in Washington, DC, Harvard in Boston, and MD Anderson Cancer Center in Houston Texas.

**Update Seminar VI: Translational Anatomy Research, Quo Vadis**

Sponsored by American Association of Clinical Anatomists

Marios Loukas, M.D., Ph.D.
St. George’s University Anatomical Services Grenada, West Indies
mloukas@sgu.edu http://etalk.sgu.edu/windref/research-investigators-loukas.html

**Abstract:** Translational research continues to be an underinvestigated area of science. One discipline that has had scant attention by those who practice translational research is gross anatomy. As a clinician and anatomist, the author has experienced success with a reverse translational research model. This paradigm identifies surgical problems and in the anatomy laboratory and with international collaboration, investigates ways of answering these issues. The goal of such research is to improve patient outcomes in an expedited manner. The author reviews his 20 year experience with identifying common clinical and surgical issues and addressing them with gross anatomic investigation.

**Biography:** Dr. Marios Loukas received his medical degree from Warsaw University School of Medicine, and a PhD from the Institute of Rheumatology at the Department of Pathology in Warsaw, Poland. He held a post-doctoral position at Ulm University Clinic in Germany in arteriogenesis and angiogenesis projects.

He began his academic career at Harvard Medical School where he served as lecturer and lab instructor for the Human Body Course. In 2005 he joined St. George’s University in Grenada. He is currently a professor and Chair of the Department of Anatomical Sciences and assistant Dean of Basic and Allied Health Sciences. Under Dr. Loukas’s leadership, the department of Anatomical Sciences developed a unique division of Ultrasound in Medical Education that instructs faculty members how to teach ultrasound to medical students and residents, and how to provide effective continuing medical education (CME) courses. Recently, Dr. Loukas was appointed Dean of Research for the School of Medicine at St. George’s University. One of his main responsibilities is to develop a transdisciplinary research infrastructure to support translational research and to bridge basic science and clinical departments with the aim of enhancing student research and publications. Dr. Loukas’ research has been continuously funded from St. George’s University. He has been the recipient of numerous teaching research awards such as the 2007, Herbert M. Stauffer Award from the Association of University Radiologists and the Harvard Excellence in Tutoring Award from Harvard Medical School. Dr. Loukas has published more than 465 papers in peer reviewed journals, authored 12 books, which include Gray’s Anatomy Review, Gray’s Clinical Photographic Dissector of the Human Body, McMinn and Abrahams’s Clinical Atlas of Human Anatomy 7th edition and authored 14 chapters in various medical and surgical books. He has also served as an editor and co-editor in 12 journals and reviewer for more than 40 journals. His scientific interests are on surgical anatomy and technique and cardiovascular pathology. Recently, his focus has been directed toward issues of integrated curriculum and faculty development in medical education with an emphasis on simulation and technology and effective teaching and testing.
Didactic Presentation Research Findings
Brantly, Betsy
A heart is a heart is a heart, right? Comparing face-to-face and online student performance. Online students taking Anatomy & Physiology II were taught to identify structures of the heart using a digital lab manual, which utilizes Anatomy & Physiology Revealed (a virtual cadaver program). Face-to-face students utilized the same lab manual and resource during their lab hours. The face-to-face students also identified heart structures on anatomical models and by dissecting preserved pig hearts. As part of their lab practical, both groups of students were given an identical set of heart identification questions, but on a heart that neither group had seen before. The heart used on the exam was a fresh cow heart presented on screen as a 3-D digital, manipulative image (i.e. students could rotate the image). The results of the group performance comparison will be presented, as well as ideas for revisions of the study.

Perrotti, William
The startling history and the present reality of cadaver dissection and body donation. For many years, human cadavers have been a mainstay in the educational preparation of physicians. More recently in the U.S., cadavers have been used increasingly in undergraduate education at both baccalaureate and associate degree-granting institutions as important elements in the preparation of nurses, therapists, trainers, physician assistants, and others. Where do these bodies come from now? Where did they come from in years past? This presentation will attempt to answer those questions by looking at the history of dissection and body procurement through the ages. The focus will be largely on Europe and North America but may drift farther afield.

Petti, Kevin
Anatomia Italiana: The Medieval and Renaissance History of Anatomy Along the Italian Peninsula. By Kevin Petti Italy’s medieval universities established the study of human anatomy for physicians. To heighten their art, Renaissance masters clandestinely examined anatomy through human dissection. The profound nexus between art and science is best demonstrated by the genius of Michelangelo. Indeed, the wooden crucifix he carved in gratitude for secret access to corpses from a convent’s hospital still hangs in the Basilica of Santo Spirito in Florence. This lecture tells a thousand-year story of anatomy as an academic discipline. From its inclusion into the curriculum of the earliest universities, to the construction of the first permanent dissection theaters, to the invention of visually arresting wax anatomy models, the history of anatomy is an interdisciplinary saga of art and science that evolved along the Italian peninsula.

Tomicek, Nanette
Good things do come from fat: adiponectin reduces cardiac damage following ischemic injury. Adipose tissue has been previously characterized as an inert storage depot. However, fat is actually a dynamic tissue that produces and secretes a multitude of hormones and signaling factors. One factor, adiponectin, has been implicated in predicting heart disease risk. Interestingly, fatter individuals have less adiponectin and are therefore at greater risk for heart disease and heart attack. The purpose of the study was to determine whether adiponectin treatment could limit the amount of cardiac damage following ischemic injury in a rat model. Indeed adiponectin treatment successfully improved functional recovery (end diastolic pressure and left ventricular developed pressure) in the heart.

Waters, John
Do You See What I See? How Students Comprehend and Learn from Figures and Graphs. Figures, diagrams and graphs play a critical role in science learning, yet many students struggle with them. These difficulties should come as no surprise given that American students receive little instruction on how to comprehend and interpret visual information. In this workshop, we will discuss our recent research in which we tested the effectiveness of five learning strategies to help biology students learn from visual representations of information.

Voloshina
Inhalation exposure to toluene induced immunotoxicity and gonadotoxicity. Toluene is a clear, colorless liquid with a distinctive smell. Toluene is a clear, colorless liquid with a distinctive smell.
occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal. To evaluate its potential adverse health effects, the immunotoxicological effects of toluene on the thymus of albino rats were investigated. Groups of rats (6 animals per group) were administered toluene at doses of 500 mg/m³ daily for 60 days via inhalation.

**Hands-on Computer Lab Workshops**

**Cornell, John**
Exploring the nerve action potential using SPIKE: Ode to Hodgkin and Huxley.
SPIKE is a nerve action potential simulation that is based on the Hodgkin and Huxley equations. Using SPIKE one can duplicate many of the results obtained by Hodgkin and Huxley. The ion concentrations used in SPIKE have been altered so that they are similar to those of a vertebrate. I wrote the original program for the DOS environment. With the free availability of DOSBox, a DOS emulator, SPIKE will run on Windows XP, Vista, Windows 7, Windows 8, Mac OS X, Fedora, Gentoo Linux, RISC OS, Debian, Solaris 10 sparc, and BeOS. In the Mac and Windows environment it may be run without administrator rights from a CD or jump drive. I have used SPIKE in non-majors courses to demonstrate the properties of the action potential. I have also used SPIKE in lower division A & P courses and in upper division General Physiology courses. Two modifiable exercises are available for students (with and without the Nernst equation). When students log in to SPIKE they get different simulations, based on their name. As a result, students cannot simply copy their results from another student. If you are looking for a nerve action potential simulation to use in your course, this may be it. Free copies of DOSBox and SPIKE are available to participants. http://www.jccornell.net/spike.htm

**D’Aleo, Judi**
A Novel Approach to Teaching EMG in a Fun Lab Environment.

In this workshop, iWorx will demonstrate one of its most popular physiology teaching labs: Observation and Measurement of EMG Activity while Arm Wrestling. The demonstration will be conducted using iWorx new TA (Teaching Assistant) human physiology teaching system that is designed to make recording and analysis of physiological data in a classroom setting easier than ever. The foundation for iWorx new teaching systems is the TA Control Module that removes may of the tedious set-up and calibration routines typically required to perform a lab. Students simply plug in the sensors and start recording and analyzing data. Novel iWire technology built in to the TA module enables simultaneous recording from multiple sensors via a single connection. During the arm wrestling experiment, electrodes are placed on the biceps and forearm muscles of both contestants to observe muscle action as different forces are used during the arm wrestling match. Using the iWire connection, students can view EMG activity from both contestants simultaneously during the experiment, making it a fun and interesting mechanism to learn about EMG. Courseware is carefully synced to iWorx LabScribe software to make the lab run smoothly.

**Windelspecht, Michael**
The Smart World: Understanding the Role of Adaptive Technologies in the New Science Classroom.
Instructors are increasingly experimenting with flipped and hybrid class structures. Yet, these environments present new challenges as instructors work to adapt traditional materials and assess student success. Using data from online and flipped classes at Appalachian State, we will demonstrate how the use of adaptive technologies is shaping the online, hybrid and flipped learning environments. The session will feature several hands-on activities that will examine what is meant by the term adaptive learning. Using the LearnSmart Advantage platform as a model, we will discuss not only how these technologies work, but also how instructors can maximize their usefulness in their specific learning environments. We will take a detailed look at the reporting functions found within these programs, and provide best practices for deploying adaptive learning technologies in the classroom.

**Melville, John**
Human Physiology with Vernier.
In this demonstration, you will learn how easy it is to integrate Vernier technology into your Human Anatomy and Physiology curriculum. Activities from our Human Physiology with Vernier lab book will be performed (Continued on next page)
using a variety of easy-to-use and affordable sensors. Come try our intuitive and innovative products, including Logger Pro software, LabQuest, and Vernier Graphical Analysis for iPad®.

**Case Studies**

**Gopalan, Chaya**
A case study approach to teaching of physiology.

We use case study to strengthen the teaching of selected topics in physiology. A typical pattern of case study involves (a) group formation (b) completion of homework that demonstrates understanding of the underlying physiology needed to solve the case, (c) an Individual content readiness assessment test, (d) answering critical thinking questions about the normal physiology involved in the clinical setting, (e) hypothesizing how the normal physiology could have failed, thus causing the clinical condition being presented, (f) preparing written group responses to case questions, (g) assessing group reports, and (h) evaluation of the participation of group members within each group.

**Ross, Kyla**
I'm not a medical doctor, but I play one in A&P!

Concerned you can't write a clinical case without a medical degree? Want to use clinical cases in your A&P course but just aren't sure how? Convinced your students wouldn't benefit from or even understand a clinical case? If the answer to any of these questions is yes, then join us for a hands-on workshop that explores how to adapt New England Journal of Medicine (NEJM) cases for an introductory A&P course. We will (1) discuss how to use clinical cases to promote active learning in any classroom (laboratory to large lecture); (2) determine constructive ways to assess students using clinical cases; (3) develop a clinical case study based on a NEJM case. Join us to gain the tools and confidence you need to play a medical doctor in A&P!

**McKeever, Cherie**
Flipping Over Interactive Case Studies: How to engage students with real-life scenarios.

Don't just sit there! Experience active learning at its best. See how role-playing as patients and members of a health care team can bring case studies and learning to life. This dynamic, entertaining session provides step-by-step hands-on experience in creating and using interactive case studies in A&P. Participants will work in groups, choose a role and simple props, and work through an interactive case study. Plus take-away template provided so you can implement this technique in your classroom immediately. Perfect for a flipped classroom.

**Shmaefsky, Brian**
Histology Challenge: Using Digital Microscopy for Case Studies Teaching in A&P.

Case studies in A&P teaching encourage students to be active learners in a learning environment that makes information in the course relevant and pertinent. They are a proven way of reinforcing A&P content for long-term retention. This presentation will use an entertaining audience-participation Histology Challenge event to demonstrate how digital image case studies can be used to embed the facts of the course in a problem-solving case study. In addition, digital imaging has been used to instill workforce skills in A&P and other allied health coursework. One example will show how dental hygiene students used actual patient case studies in a patient education program on oral hygiene. This student-run project linked the information in their coursework into a holistic systems approach to learning pertinent concepts in A&P. This project was partly funded by National Optical (Swift Optical Instruments) and in fulfillment of a project for the BEN Scholars: Building Digital Resources to Power 21st Century Biology Education program.

**Bonge, Pat**
Cancer as an Integrative Topic in Anatomy and Physiology.

We have all seen students who memorize individual physiological pathways beautifully, but “hit the wall” with the tasks of identifying which of these pathways is related to a given scenario and predicting what will happen when more than one pathway is affected at the same time. Yet students are fascinated by the medical topics that require just this kind of thinking. This workshop presents end-of-course summary activities using the topic of cancer. Students use anatomy to predict the complications of a specific tumor, and physiology to predict the consequences for the patient.
In this workshop we will discuss some strategies used in lecture to promote student-centered learning. One example will be the use of Learning Assistants (LAs). LAs are undergraduate students that sit-in during lecture and facilitate group activities; they receive pedagogical training in preparation for their role in lecture and participate in the course the duration of the semester. LAs have been used in classes ranging in size from 80 to 500 students at Penn State. The use of LAs in conjunction with several other techniques will be explored, as well as experiences and ideas shared by the workshop attendees. Come on by and get some ideas on how to give your students a voice during lecture, even in a large setting!

Mcfarland, Jenny
Homeostasis: How do we use diagrams to teach this core concept? Homeostasis is an essential concept in physiology. We will explore how diagrams are used in student learning of negative feedback and homeostasis. We will (1) share and evaluate diagrams used in teaching and textbooks, (2) discuss the advantages of particular diagrams to reinforce learning, (3) explore the misconceptions that might be unintentionally reinforced and (4) distinguish between homeostasis and negative feedback. In addition to examining the elements of a diagram that help students develop an accurate, working understanding of homeostasis we will discuss how diagrams can be used repeatedly to reinforce learning in courses and textbooks. Supported by NSF DUE-1043443.

Makstenieks, Santa
The “Casino Classroom”: incorporating games and educational technology as a tool for learning. Humans are genetically wired to see the material from a new and more approachable perspective. This workshop will focus on helping instructors build new ways to present, and even demonstrate, difficult concepts including: glomerular filtration, lung volume and pressure relationships, muscle contraction and ABO blood typing.

Runyeon, Jon
Creating unique active learning pre-class assignments to help students (and instructors) get the most out of their limited class time together. In order to maximize the time spent in the classroom and lab, students are often directed to specific readings or given assignments to prepare, but often with dissatisfying results. This can be frustrating for instructors utilizing an active learning approach; for students to be interactive, they must be prepared. Student engagement and ownership in their preparation is enhanced through the creation of their own unique resource. This workshop will focus on the design of meaningful preparatory assignments, and how to use this work during class and on exams. Sample assignments and data from the University of Oregon's anatomy program will be presented.

Robertson, John
Top-Down Activities for Anatomy & Physiology
Top-down approaches start with a broad perspective (e.g., a group or a
whole organism) and work down (e.g., to systems, cells, molecules) in order to facilitate integrated understanding. Landscape level assignments offer a number of benefits for A&P courses that are taught using a bottom-up, hierarchical organization approach; clinical case studies are a classic form of this approach. Incorporation of varied top-down exercises provides opportunities to reinforce and build on course material, and allows students to adopt a broad perspective in integrating course material and concepts in novel and creative ways. Specific top-down activities used in A&P courses will be described and discussed. One exercise involves use of advertisements for pharmaceuticals as a gateway for an exploration of drug chemistry and biochemistry, mode of action, and system-to-cell effects, including side effects. Another assignment is a group peer-education project that centers on an issue in biomedicine with a strong relation to A&P course content. Students research the issue and develop and administer a survey to assess peer knowledge of and attitudes toward the issue and underlying biology. They then analyze and interpret findings in light of clinical approaches to the issue, including devising strategies to help effectively provide information on the issue. Students produce a poster on their work that they present in a public forum. Assessment of instructor and student reaction to these assignments, including perceived educational value, will be presented. Discussion of this approach and these activities, as well as related exercises used by workshop attendees, will be encouraged.

Schinske, Jeff

On equity & diversity in the A&P classroom: initiating discussions about scientists from diverse backgrounds while covering A&P content. A&P instructors serve students with varied ethnic backgrounds, ages, religions, sexual orientations, temperaments, socioeconomic backgrounds, and abilities/disabilities. Some students might view themselves as different from a “typical” scientist, which could present barriers to engagement and learning. Introducing diverse scientists might broaden students’ ideas regarding who does science, but how can we structure such activities and integrate them with course content? Workshop participants will discuss the utility of incorporating diversity into the A&P curriculum and will experience an activity that covers content while introducing scientists from diverse backgrounds. Resources for identifying other diverse scientists for use in class will be provided.

Schutte, Audra

Reflective journaling as a means to improve learning in A&P. Do your students struggle to effectively regulate their own learning? I will discuss the use of reflective journaling in an anatomy supplemental study skills course, which could also be implemented in a regular A&P course. These journals allowed students an opportunity to grow as learners and provided instructors with valuable student feedback. I will also discuss the development and use of a codebook to analyze the journals after the completion of the semester. This allows for measurement of changes in students’ habits and awareness of their learning over the course of a semester.

Strang, Kevin

Powerpoint and “passive” need not be synonymous: Games and cases for learning endocrine physiology using Powerpoint interactively. A great way to help students learn physiology is by using interactive case studies and games. Although Powerpoint is generally thought of as a vehicle for passive learning, with a little creativity it can be used as an excellent tool for creating interactive exercises. In this workshop, I will share some games and cases developed in Powerpoint to help students learn endocrine physiology. Workshop participants will work in teams to showcase their endocrine knowledge by playing some of the games, followed by a general discussion of how to use Powerpoint more interactively in labs, small groups, and even lectures. Come and play!

Sullivan, Stephen

Students coming to lab and lecture under-prepared? Want more time in your classroom? Assignable adaptive learning tools are effective ways to prepare students to engage in a discussion, rather than be lectured to. Adaptive learning is a method of education that personalizes learning by continually assessing students’ knowledge, skills, and confidence levels and automatically designing and delivering targeted study paths. This helps instructors bolster students’ understanding in the areas where they need to improve the most. By helping students focus their outside-of-class study time on the topics and concepts that are most challenging to them, adaptive learning has been shown to help students study more efficiently, develop greater proficiency, and earn better grades. In addition, it helps professors “flip the classroom” so students come prepared for a discussion and/or application of concepts rather than being lectured to.

Restructuring the Classroom: From Flipping to Problem-Based Learning

Feinstein, Jill

Flipping the anatomy and physiology classroom for community college students. Have you ever wished that you could discuss anatomy and physiology topics in more detail while incorporating more pathological and clinical cases into your course? I will explain my trials, frustrations, and successes in flipping the classroom on my Anatomy and Physiology I & II courses. This presentation will focus on knowledge gained from transforming traditional classes into flipped courses, allowing students to spend more time with the material while creating an investigative atmosphere in the classroom. Don’t forget to bring a jump drive; I will distribute examples of successful case studies, activities and labs to anyone who is interested.

(Continued on next page)
**McFarland, Robin**

Problem-based approach to learning musculoskeletal anatomy: Focus on evolution of human locomotion. Science education research demonstrates the effectiveness of student-centered, active learning rather than memorization. Anatomy has been criticized for emphasizing memorization. Whether endurance running was a key innovation in human evolution is a question that underlies an anatomy problem-based learning exercise. Students identify evidence for the hypothesis that running is a fundamental human adaptation; for example, hominin fossil anatomy, comparative anatomy, and modern human locomotion. Students share information and evaluate whether endurance running is a central human adaptation. The exercise applies anatomical knowledge to a scientific question and is an example of how advances in science education may be applied to anatomy.

**Meyers, Rhonda**

Flipping the classroom in A & P? The idea of a flipped classroom is gaining popularity in many disciplines yet seems to be a daunting task for the science classroom. Lecturing is the mode of familiarity and longevity. Yet is this really engaging students in the material? Flipping allows the student to watch and listen to your lectures prior to class. The classroom then turns into a time of discussion and activities to solidify this material. Participants in the workshop will learn the challenges and the success of an actual flipped classroom. They will be shown various ways to do activities such as group work, iPad usage, and Socrative. Join me in this exciting journey that establishes dialogue and idea exchange leading to educators having time for engagement and interaction with the learners.

**Jensen, Murray**

The HAPS POGIL Project, Part 1. An introduction to the POGIL program. Process Oriented Guided Inquiry Learning (POGIL) is a teaching and learning strategy that combines cooperative group activities with constructivist learning theory. Recent NSF grant funding has allowed a group of HAPS members to develop POGIL curriculum modules for entry-level anatomy and physiology. This session will focus on details of the NSF POGIL grant, provide background on the POGIL teaching strategy, and give participants a chance to engage in an example POGIL activity.

**Jensen, Murray**

The HAPS POGIL Project, Part 2. POGIL curriculum materials for human anatomy and physiology. The HAPS POGIL project has generated curriculum materials for entry-level anatomy and physiology students. The materials promote conceptual learning through active learning endeavors and provide a practical alternative to lecture. This session will feature the unveiling of sample POGIL activities from the first half of a typical course, such as those focused on levels of organization, the skeletal system, and the muscular system. All materials generated by the HAPS curriculum project will be free to HAPS members.

**Jensen, Murray**

The HAPS POGIL Project, Part 3. POGIL curriculum materials for human anatomy and physiology. The HAPS POGIL project has generated curriculum materials for entry-level anatomy and physiology students. The materials promote conceptual learning through active learning endeavors and provide a viable alternative to lecture. This session will feature the unveiling of sample POGIL activities from the second half of a typical course, covering topics such as those from the nervous system, the lymphatic system, and the reproductive system. All materials generated by the HAPS curriculum project will be free to HAPS members.

**Roychowdhury, Hiranya**

An Active Learning Zone: Reforming the traditional classroom. I will demonstrate my teaching approach in making my students active in their own learning. No single tool has worked alone, as might be expected, but one method that has worked wonders in my classroom is the application of Problem Based Learning (PBL). I have blended the essential features of PBL with Team Based Learning, Classroom Response system, Two-Minute writing, and other instruments, and have received encouraging response in terms of student engagement and performance. My workshop will demonstrate the controlled chaos environment in which I make my students learn the content without using too much lecture on any topic.

**Stanfield, Cindy**

Team Based Learning: A Different Approach to Teaching Anatomy and Physiology. The University of South Alabama instigated Team Based Learning (TBL) throughout the curriculum, from freshman orientation courses to senior and professional courses. We will present how TBL has been implemented in anatomy and physiology-related courses in allied health. We will discuss why we adopted the Team Based Learning approach and how we used it to improve classroom learning. This will be a hands-on workshop where participants will go through a first day experience in the course, including developing teams, taking a readiness assurance test (RAT), and doing a team exercise.

**Welch, Jennifer**

Problem-based learning in a two-semester Anatomy and Physiology Course: What is it and how to get started Problem-based Learning (PBL) is a pedagogy through which students learn course content in the context of real-world, “messy” problems. The classroom is student-centered with the students working in groups to discover information necessary to solve the problem. The instructor serves as a facilitator rather than lecturer. The problems differ from case studies, as they do not lead to a diagnosis or treatment, but rather to lead the students on a pathway of discovery. Problem-based learning was introduced at Madisonville Community College in 2010 and has been growing in success with students and faculty alike.

(Continued on next page)
Spice up Your Labs – New Lab Exercise Ideas
Kish, Steven

Digestive trouble? We can help! The digestive system is one of those body systems that we do not think about much, until something goes wrong. Building the digestive system on a model allows for a 3-D examination of this complex and fascinating system. In this hands-on session, participants will build the digestive system in clay and see how this method can help your students develop a better understanding of the anatomy of this system.

Kish, Steven

“O” say can you...trace a drop of blood?  The cardiovascular system is one of the most important systems we have in the human body, yet students do not often see that importance. Building the cardiovascular system on a model allows the cardiovascular system to be isolated, making tracing a drop of blood easier to visualize. In this hands-on session, participants will build the cardiovascular system in clay and see how this method can help your students develop a better understanding of the anatomy of the cardiovascular system.

O’Dell, Lauretta

Sewing the endocrine system together: making concept connections with needle and thread. Students find the complex physiology of the endocrine system perplexing, especially the multi-step action of tropic hormones. With hands-on practice using color-coded thread, labels, and cardboard cut-out organ systems, students develop a feeling for the connections between hormones, their targets, and their effects. This workshop will allow participants to create a threaded concept map of the endocrine system in an exercise that might be duplicated in any anatomy and physiology classroom.

O’Shaughnessy, Molly

Using Comparative Anatomy to Reinforce Human Anatomy, or, an Ulna is an Ulna, is an Ulna. Come and experience a lab that utilizes owl pellets, mammal skulls and bones, human and hominoid skulls, radiographs, skeletal pathology specimens, and other observations to develop a deeper understanding of the characteristics and landmarks of various bones, as well as the concept of form following function as it relates to the skeletal system. Participants will use divergent thinking skills when they compare a horse’s front leg with a bat’s wing and the human hand. The lab acts to review, enrich, and solidify knowledge of skeletal anatomy prior to a skeletal practical exam.

Rawding, Robert

Reinforcing acid-base principles in a medical simulation lab. This workshop presents the evolution of a hands-on approach for students to make clinical observations of patients in acid-base balance stress: from lecture pre- and post-tests (Theory) to group laboratory problem solving (Application) to patient care observation and management (Clinical). It includes a walkthrough of an Institutional Review Board application and approval, implied consent forms and data custodianship, sample student assessments along the way, student feedback and statistical analyses, and submission for journal publication. It includes a pictorial tour through a state-of-the-art medical simulation laboratory. Copies of requisite documents will be available to attendees.

Shmaefsky, Brian

The value of lab kits for online and hybrid A& P courses: Lessons learned from a converted skeptic. There is much argument over the pedagogical value of “use at home” lab kits for teaching anatomy and physiology. Particularly, there is much contention about on-line courses that do not require students to visit the college for supervised laboratory sessions. In spite of the vehement disagreements about “at home” labs, many colleges are compelled to offer full online courses. Colleges offering full online A&P courses must have a strategy for providing students with the same learning experience as students in classes that teach laboratory sessions on campus. This presentation discusses strategies for using “at home” labs in a way the encourages critical thinking to reinforce learning and takes advantage of opportunities student use to find assistance from family, friends, professionals, or the Web with laboratory activities Also covered in this presentation how to offer faculty training when using lab kits for online and hybrid science courses. It is essential that all full-time and adjunct faculty are properly prepared for the teaching online science courses labs and labs that students perform at home with a lab kit. Simple to follow principles for faculty preparation during ins-service time or through virtual training can aid in the success of your A&P students. Also learn how one school “GIVES BACK” with their used lab kits through service learning. The integration of STEM, learning outcomes attainment, and civic responsibility can make a difference for your students and community by using lab kits for online A&P courses.

Zanetti, Nina

Beyond the Microscope: In Pursuit of a More Lively Histology Class. Traditional histology labs are sometimes perceived as dull, partly because “normal” lab exercises in these courses tend to be sedentary and observational, as compared to the active, experimental labs of many other science courses. In this workshop, we will explore a range of activities that can both liven up a histology lab and also help students master some of the more difficult aspects of histology, such as interpreting two-dimensional sections and memorizing terminology. This presentation discusses strategies for using “at home” lab kits in a way the encourages critical thinking to reinforce learning and takes advantage of opportunities student use to find assistance from family, friends, professionals, or the Web with laboratory activities Also covered in this presentation how to offer faculty training when using lab kits for online and hybrid science courses. It is essential that all full-time and adjunct faculty are properly prepared for the teaching online science courses labs and labs that students perform at home with a lab kit. Simple to follow principles for faculty preparation during ins-service time or through virtual training can aid in the success of your A&P students. Also learn how one school “GIVES BACK” with their used lab kits through service learning. The integration of STEM, learning outcomes attainment, and civic responsibility can make a difference for your students and community by using lab kits for online A&P courses.

Get Online – Technology in Lecture and/or Lab
Austin, Terr

Pain free ways to incorporate technology into your classrooms. Technology is our new best friend in the classroom. It has proven to...
raise grades. Your students have it incorporated in their other classes, and you want to do the same in yours. In this session a Pearson Faculty Advisor will help you set up a Pearson MasteringA&P site, and get your basic set up in just a few minutes. The rest of the time will be spent to go over easy ways you can use MasteringA&P and the technology that it contains to help your students inside and outside the classroom improve their A&P experience and grades.

Belliveau, Daniel
Head-to-head: an online anatomy tournament module to reinforce anatomical knowledge. Returning competition into the classroom, this workshop explores the role of direct competition as a stimulus to learning. Using an innovative online and real-time tournament module developed by Top Hat Monocle, we explore the value-added element of tournaments to exam preparation. This workshop will review the findings to date in our study and introduce participants to the tournament module, learning how to organize practice sessions and tournament game play. The tournament module consists of nearly 500 questions covering all systems. Bring your laptop, smart phone or tablet to take full advantage of the experience.

Bush, Eileen
Vending machine nutrition. This is a demonstration of a customized laboratory exercise used at MVCC that demonstrates digestive and endocrine physiology. Using an ADInstruments LabTutor teaching suite, participants will participate in a directed experiment to test glycemic digestion of different types of commonly available vending machine snacks. In small groups participants will actively predict and test their hypotheses about the speed of carbohydrate digestion. Participants will also investigate how the presence of different nutritional variables (e.g., presence of proteins and fats) affects carbohydrate digestion. Finally participants will examine experimental design and data analysis using the LabTutor.

Colgan, Wes
LabTutor 4 Learning Modules enhance student experience with LabTutor Online.
LabTutor 4 suite has more functionality than ever. Come see how LabTutor 4 learning modules allow you and your students to get the most out of your laboratory course. ADInstruments’ innovative software enhances teaching and learning and is now easier to use for teachers and students. An overview of the latest in online laboratory course delivery will be demonstrated using LabTutor Online. See the latest on how students can access pre-lab materials and post lab data analysis over the Internet.

Fried, Aaron
Developing the vending machine nutrition experiment to develop an inquiry-based activity. This demonstration will show the steps in planning, customization, development, and deployment of a nutritional analysis lab exercise using ADInstruments LabTutor software. This session will focus on the process of refining the experiment as well as the development of the experiment within the ADInstruments LabTutor Teaching Suite. Use of the LabTutor allows a scaffold to build an experiential learning cycle around an analysis of blood sugar levels after ingesting different food types. The LabTutor environment makes it easier to control that inquiry-based environment with a group of students. We will focus on presenting practical examples of how the software components work including asset management, content editing, experiment deployment and student assessment. Benefits and drawbacks as well as ways to overcome those drawbacks will be discussed.

Gopalan, Chaya
Effective ways of using the latest technology in the teaching of physiology
While video capturing of lectures to help students learn the lecture material outside the classroom has many advantages, there are new challenges that follow this pursuit. The flipped classroom approach of using prerecorded lectures to allow students to interact with the instructor and/or peers in the classroom is a powerful active learning methodology. In addition, the use of iPad, and online assessment tools and the pros and cons of these applications will be discussed.

Heisler, Ruth
Creating a 21st century learning experience in your anatomy laboratory. Feeling the pressure to update the way in which material is taught in your labs? It isn’t easy to create a new learning environment for your students, nor is it always necessary to completely change the methods that have worked in the past. Pulling on our combined experiences in both gross anatomy and A&P labs, we will share what has worked for us. Some of the topics covered will be how to implement online teaching resources; effective use of online quizzes; successfully implementing a jigsaw learning method into the lab; and utilizing software to complement and not replace hands-on learning.

Hoover, William
A digital and “hands on” alternative to virtual labs. Students and professors find great value in online lab simulations. They are used in the lab setting to guide lab discussions. They are also assigned as pre-lab activities to prepare students for the wet lab. However, there still seems to be a void that needs to be filled when comparing them to the traditional lab. Through an entirely digital lab text, requiring “hands on” activities, students and professors can experience the best from both worlds.

Kellar, Robert
Addressing new laboratory classroom challenges with hybrid instruction. Hybrid sections of Anatomy & Physiology Laboratory I course were recently piloted. These sections alternated weeks of “in class” instruction with “off weeks” complemented by on-line instruction and self-study activities to reinforce concepts. Lectures were delivered on Blackboard in A-V format.

(Continued on next page)
CONNECT laboratory assignments and digital pathology using the APERIO digital scanning platform were used to provide students with self-study opportunities outside of the classroom. Digital pathology was adopted onto iPads, Macs, and PCs. Overall, technology was leveraged in the classroom to provide new learning modalities for students, to help improve performance, and to meet enrollment growth in this course.

Lehman, Thomas
Using iPads for Histology, Case Study, and Practical Reviews.
I started using iPads for review sessions in Spring 2012 and have been amazed at the success. The students are so much more engaged during review sessions. Microscopy has always been a bane for many of my students and the iPad review sessions have been thoroughly embraced. Come experience how we use these devices to assist in learning microscopy, case studies, and other A&P activities.

Lloyd, John
The Integration of a Virtual Cadaver Dissection in an A & P Laboratory
Since the fall, 2006, the McGraw-Hill's Anatomy & Physiology Revealed (APR), an interactive cadaver dissection experience has been used in the teaching of anatomy & physiology to various pre-health professional students (mainly pre-nursing majors). Along with anatomical models and various wet tissue specimens, this program has been an effective learning tool. With the APR, students are able to literally dissect a cadaver anywhere (24/7). APR allows the student to peel away layers of the human body on their computer screens to reveal more than 5,000 anatomical structures from the various physiological systems of the body. Why APR? When there is not a real cadaver in the lab, this program is an excellent substitute. Concerns of cost, dissection itself, and exposure to formalin disappear and students do learn anatomy. In addition, the APR has animations, histology, imaging, and quizzes and lab practicals. In this workshop, the presenter will demonstrate how the APR is integrated in the lab and how lab exams are created and implemented by using the APR.

Navaroli, Vicky
Dinner, dishes and dissection: Using eScience lab experiments as a tool for teaching fully online Anatomy and Physiology labs. It is important to any college to increase student retention and accommodate various learning needs. As professors, we hear student complaints about attending class and keeping motivated while providing for their families in this growing economy. We have designed a fully online Anatomy and Physiology 1 and 2 course so that students can learn from home. These courses include dissections and interactive labs experiments provided by eScience Labs. After one piloted semester, student enrollment has increased, lab and discussion interactions were overwhelming, and overall GPA improved as a result of independent learning.

Perkins-Johnston, Penny
Learning by Building: Online Tutorials Guide Student Hands-On Experience. Learning origins, insertions and actions of the muscular system is challenging for students. Typically, anatomy and physiology courses use dissection of cats or fetal pigs to give students laboratory experience with skeletal muscle structure. Clearly, there is a difference between human musculature and that of quadrupeds. In order to give Kinesiology students a lasting and realistic understanding of skeletal muscle structure, origins, insertions and actions, muscles were fashioned out of modeling clay and attached to unique skeletal models. Students check out a model that they will use throughout the semester. The instructor supplies worksheets and directions on building muscle groups using clay. Students build the muscle group, photograph and label their work according to the report template provided. Grading rubrics are used to assess the quality and accuracy of student work. Because students do their work outside of the laboratory, we produced online tutorials to exemplify how to build the muscles, and the location of their origins and insertions. Muscle group actions are performed by kinesiology students and incorporated into the video. In this workshop, we will demonstrate all of the above.

Simon, Fran
Online learning resources: how to use Connect.
Do your students ever ask for sample test questions? Do you wish your students had better retention of the material or a higher level of learning than just memorization? With the generation of students being more tech savvy than previously, online/interactive learning is becoming an invaluable resource. Although every instructor wishes they had time to create multiple questions and resources for the students, we are all quite busy. Connect has done the work for you. Come see how easy it is to create and use online/interactive learning resources within the Connect platform.

Straud, Sarah
Fusing Online and Active Learning Strategies in the A&P Classroom
Scientific inquiry, critical analysis of data, and synthesis of ideas are key skills STEM majors must possess in order to be successful. To improve these higher-order thinking skills, I have added online Mastering A&P labs and associated activities to my course. In this workshop, I will discuss how these labs have improved students’ analytical skills, and the tools used to reinforce and assess these skills. Other experiences are welcome for discussion.

Yenser, Amie
Practical Uses of Mobile Devices for Anatomy & Physiology
Looking for a way to actively engage your students in your classroom? In this hands-on session, I will provide participants with simple, yet effective pedagogical techniques using mobile devices in the classroom. Research indicates that over 60% of cell phone users are addicted, checking their phones at least once per hour throughout the day. As educators, we can utilize this to our benefit to capture
the attention of every student in the classroom (even those persistent texters in the back of the room!). Leave this presentation with simple, quick pedagogical tools you can use tomorrow.

Panel or Participant Discussion Session:

Heisermann, Gary
Enliven your anatomy and physiology course by adding humor! (It won’t hurt, I promise.)

Anecdotal evidence strongly suggests that people like to laugh! (Seriously - students do seem more interested and engaged when they laugh more). I will share a variety of strategies I have developed for “spicing up” my classroom presentations, adding humor and laughter while still focusing on course content. After an initial presentation and discussion, we will break into small groups and brainstorm ideas. Bring any “tried and true” methods to share. Let’s keep students wondering what we’ll do next!

Karkow, William
Histology Challenge - are you smarter than an undergrad iPad?

Come to challenge yourself with new case presentations. See what student-generated images you can figure out for yourself if the shoe is put on the other foot. Consider how you can stay one step ahead of your charges, even if histology is not your forte. Flock here to confess your limitations among us shepherds, while we chew over how to pull the wool over our sheep’s eyes. Meander this way to see the leader of the pack stumped, whilst you ravage him with faux paws. Ruminant over how much histology is considered good taste for undergrads.

Karkow, William
Use hospitals to help students do histology.

How can one get students to create full histology presentations, while doing it “on the cheap”? We will walk through the processes of students sectioning their own specimens, creating, staining and photographing their own slides, and creating composite photos. Student hospital-assisted case presentations will be shown, discussing the necessary permissions, materials and methods. Why do all the work yourself?

Rawding, Robert
“And This Is How I Teach That” - Part 1: Neurophysiology, Acid-Base Balance, and Digestion.

This workshop is interactive; bring your techniques to share, demonstrate, and exchange. The presenter will lead off each of the 30-minute rounds with a brief 5-8 minute presentation in each of three topics areas. Within each round, workshop participants may likewise present their tips-’n-techniques for better student comprehension. Part (A): summation, EPSP’s & IPSP’s and impulse generation; Part (B): acid-base balance problem solving, and Part (C): hormones that almost completely dominate initial digestion and signaling to accomplish assimilation.

Rawding, Robert
“And This Is How I Teach That” - Part 2: Reproduction, Osseous Tissues, and Gradients

This workshop is interactive; bring your techniques to share, demonstrate, and exchange. The presenter will lead off each of the 30-minute rounds with a brief 5-8 minute presentation in each of three topics areas. Within each round, workshop participants may likewise present their tips-’n-techniques for better student comprehension. Part (A): prenatal differentiation of the sexes; Part (B): dynamics of the skeletal system, and Part (C): gradients: how to make ‘em & how to work ‘em.

Saladin, Ken
Mythbusters of A&P

This workshop explores some ideas that are quite common in A&P textbooks but that, to quote Sportin’ Life, ain’t necessarily so. I will present some propositions that I think are widely believed and taught, but false, along with some foils that are presumably true. Participants will vote true or false for each, and for the false ones, I will explain why they are so and invite discussion among participants. I may be right and perhaps offer some thinking that reshapes your teaching; or I may be wrong and find I need to rethink some issues after hearing your thoughts. Right or wrong, the idea is to share some provocative ideas and go home reflecting on A&P myths we’ve been teaching for years, but that ain’t necessarily so.

Saladin, Ken
You Say ba-NAN-ah, I Say bah-NAH-nah.

How do YOU pronounce “mediastinum”, “apoptosis”, or “acetylcholine”, as you were taught orally, or as a dictionary says they “should” be pronounced? Is there a difference? Are you sure you’ve been teaching your students correctly? What defines correct pronunciation, anyway? This interactive workshop will use PowerPoint slides of alternative, correct and incorrect pronunciations of common A&P terms. Participants will vote on the way you think they should be pronounced. Differences of opinion will serve as a springboard for discussion of variations in pronunciation, how we learn pronunciation, oral tradition in A&P, and disparities between common practice and dictionary recommendations.

Skills for Anatomy and Physiology

Lathrop-Davis, J. Ellen
Helping students succeed in the A&P classroom.

Are you frustrated with students who lack study skills? Do they have skills that just don’t work? Do you teach online or hybrid/blended courses? This presentation will highlight a variety of strategies to increase students’ awareness of study skills and techniques related to successful completion of both traditional and hybrid A&P courses. Techniques include take-home exams, pre-test quizzes, writing assignments, and classroom and online interactive activities.

(Continued on next page)
Lexis, Louise
Using capstones to develop research skills and graduate capabilities: a case study from physiology.
Two physiology capstone subjects were recently introduced with the aims of providing an effective culmination point for the Bachelor of Health Science course and to offer students orientation to opportunities for further study, employment and career development. This workshop provides an overview of the research skills-related assessment tasks of the capstone program and an evaluation of its early success based on student performance and feedback and staff perceptions. We will provide an insight into the challenges of developing and implementing capstone subjects which, due to a strong student-centered approach, have different staff and resource requirements to more traditional subjects.

Norman-McKay, Lourdes
Fostering habits of the mind: enhancing critical thinking in undergraduate A&P courses
Critics claim that undergraduate education is not adequately preparing students; deficiencies in critical thinking are especially cited. This session explores the following topics with the goal of empowering faculty to help students foster habits of the mind: (1) the role of student readiness in priming higher cognition, (2) how learning outcome data is central to teaching and higher order learning, (3) employing formative evaluation as a cornerstone for developing higher cognition, (4) using Mastering® and PhysioEx to infuse more critical thinking opportunities into the A&P classroom.

Patton, Kevin
Helping A&P Students Succeed: using supplemental courses and workshops to reinforce concepts and promote learning skills.
Do your A&P students struggle with the whole process of learning? Do they seem ill prepared in their study skills and their knowledge of basic principles of biology? Explore case studies in which optional student workshops and short supplemental courses provide underprepared and unskilled students with knowledge and skills that make them better able to succeed in the A&P course and beyond. You will also receive free resources to help your own students succeed.

Regan, Jennifer
Group-learning metacognitive activities in human anatomy and physiology courses.
Metacognition is defined as “knowing about knowing” or thinking about how we understand concepts and identifying methods and activities that increase our learning process. Many freshman and sophomore level college students have not been challenged to consider how they learn and how to develop useful strategies to improve the extent of their understanding of different subjects. Considering one’s learning process is important because it allows a person to plan and use methods that best support true understanding of a particular subject. If students are challenged to explore their own learning process and recognize methods of increasing their understanding, these tools will become part of their overall learning strategy and benefit them in their overall academic career. In this workshop, we will explore different activities that can be used in lecture or lab courses that challenge students to discuss difficult material while encouraging the students to fully share their thinking process and learning strategies.

Schuijers, Johannes
Developing a broad skill set in those students undertaking a physiology practical subject.
Physiology laboratory skills often get confused or lost when the practicals are embedded within the theoretical part of the subject. This workshop will consider the benefits of separating a typical physiology subject with embedded practicals into two subjects: a theory and practical subject. The separation of subjects afforded us the opportunity to demark skills associated with the understanding of core theoretical information from a clearly distinct set of skills associated with scientific enquiry, scientific instrumentation, data collection and analysis, and scientific writing. We will discuss the development of distinct learning objectives and assessment tasks for each subject.

Assessment
Arle, John
Effective independent assessment using your campus LMS.
This workshop examines both formal and informal assessment techniques using common Learning Management Systems. See how LMS assessment technology can be utilized to create better measurement of learning outcomes while actually increasing instructional time on task. Once structured, online assessment releases instructor time for more creative instructional purposes. Even traditional lab practicals can be brought into the digital age with no more pinning, taping, pointing, or 3x5 cards. These very same technologies can be set for student self-assessment that is specific to your instruction and your class rather than the common shotgun approach offered by most publishers. Enhanced assessment may arguably be the best use of online LMS systems and this session shows and discusses how you can take advantage of what's already available on your campus.

Carroll, Melissa
Competitive Collaborations in the Classroom: Formative Assessment Techniques
Tired of getting blank stares during lecture because students are not engaged or focused on the material being discussed? As instructors it is our duty to create a safe and integrative, yet academically challenging, classroom environment. Biological sciences already serve as the challenge and current research states that students do well when there are challenging goals that are associated with academic achievement. During this workshop we will explore the creation of classroom learning contracts, formative assessments and collaborative assessment techniques as discussed in the Biology Scholars Assessment Residency.

(Continued on next page)
DeFriez, Curtis
Unveiling the New HAPS Competency Exam: How to Use the New Online HAPS CE at My Institution.
The testing Committee for HAPS has been working for 6 years to develop a new online competency examination that conforms to the HAPS Topics and Outcomes put forth by the society as best practices for teaching a year-long Human Anatomy and Physiology course. The new test is a 100-question exam, each question chosen in a randomized fashion from a multi-question test bank consisting of several hundreds of questions. Subcommittees of the testing committee and members of the HAPS board of directors developed the test bank. Each question in the test bank is linked to 100 specific topics chosen from among the 19 Modules set forth by the HAPS Learning Outcomes Project. The new HAPS Competency Exam (HAPS CE) will serve as a tool for measuring outcomes of Anatomy and Physiology instruction by those interested in quantifying student performance and documenting the integrity of their instructional pedagogy. The advantages of administering this exam in an online-only environment, and the mechanics of the new test will be explained in this workshop. The workshop will also be an ideal setting to answer questions and explain procedures for those instructors not accustomed to giving online exams to their students.

Garrett, Lori
Assessing and Remediating A&P Students Before They Arrive in Class. We are too often frustrated by students who, often through no fault of their own, arrive in our classes woefully underprepared for the rigor of A&P. Yet rarely can we require prerequisites to improve student success. In today’s academic atmosphere that increasingly emphasizes completion and retention, we realize many of our students are doomed to fail and perhaps repeat the course, or we may lose them forever. Combine a flood of underprepared freshman with renewed external discussion of performance-based funding for education, and our own classroom performance may soon be under the microscope as well.

In this session, we will discover a powerful solution to this problem. MyReadinessTest for A&P is a comprehensive A&P prep system with four goals: 1. Assess pre-A&P students’ proficiency in foundational science and study skills, 2. RemEDIATE in core areas with practice and review, 3. Improve student confidence, and 4. Improve student (and thus our own) success.

Jennings-Pineda, Joyce
Assessment of learning in anatomy and physiology “round three”: “coming full circle”.
This is a third and final presentation (Round One: 2005, Round Two: 2007) on the steps of developing and implementing an assessment plan for Human Anatomy and Human Physiology at Missouri State University West Plains. This presentation demonstrates the full implementation of the plan from institutional mission to course objectives and culminates with analysis of data used in the budgeting process. It is more difficult for administrators to say no if you can demonstrate a direct tie to learning outcomes!

Presentation of Best Practices
Dais, Julie
Sharing data collected in physiology labs among colleges.
In order to increase interest in data analysis among first-year students in anatomy and physiology labs, sharing the data collected between colleges has been suggested (Cyberlearning in Community Colleges Workshop, 2012). An additional benefit to this activity would be an increase in sample size. However, there are some challenges to this process such as the use of different protocols and collection equipment (i.e. Logger Pro, BioPac, iWorks, etc.). The goal of this workshop is to bring together interested people to determine which data could be collected (such as EKG, lung volumes, hematocrit, other?), develop common protocols, and create a repository for sharing the data in the future.

Dunham, Stacey
Transforming review sessions: interactive use of practice exams for effective student review in class settings.
Many students ask for a review session prior to the exam, but attendance is typically low and few have questions to ask. Rather than simply hosting a question and answer session, instructors can incorporate a practice exam to engage students and to generate additional relevant questions. This session will discuss the benefits of using practice exams to improve student learning and outline approaches for using practice exams individually, in small groups, or in large class discussions for review. Instructors will leave with an action plan to develop review sessions centered around the use of practice exams.

DeHart, Barbara
Advising for medical school: myths and facts.
Medical school ranks as one of the most popular career goals among incoming first-year students in the Life Sciences. As such, this presentation will focus on how faculty and advisers can help their students prepare and succeed when applying to medical school. The information provided will help faculty and advisers become familiar with current medical school statistics, the characteristics of a competitive applicant, and to distinguish between medical school myths and facts. Furthermore, we will look at traditional and non-traditional ways of applying, as well as the important role that faculty and advisers play in this process. The presentation will be followed by a question and answer session.

Gerrits, Ron
The Carnegie Mellon University, Open Learning Initiative (OLI) anatomy and physiology course: a resource for both students and educators.
The Community College Open Learning Initiative (CC-OLI) project used a collaborative approach to bring together faculty across institutions, including several HAPS members, to develop a free and open anatomy (Continued on next page)
and physiology course. The course is centered on the learning outcomes developed by the HAPS Curriculum and Instruction Committee, and can be used independently by students or by faculty as a course supplement. This presentation and discussion will focus on the goals of the OLI course, its implementation, and how immediate student feedback and faculty tracking of student performance can be beneficial to faculty, students, and physiology education in general.

Jensen, Murray
High school anatomy and physiology offered through a dual enrollment program.

Murray Jensen's Essentials of Human Anatomy and Physiology course is currently offered in over 20 high schools through the University of Minnesota's College in the Schools program. This workshop, led by Professor Jensen and two high school teachers, will focus on how the program is run, describe the student-centered curriculum used (e.g., POGIL activities), and also provide details on how teachers "flip" their classrooms in order to promote individual learning at home and cooperative group learning in the classroom.

Kerr, Kim
Using cadavers in anatomy and physiology lab.

Using cadavers in anatomy and physiology lab can be a great experience for students. In this workshop I will show how Troy University started a cadaver lab with only a small space and few resources. We will discuss materials used, student response and interest and how having a cadaver lab may help prospective students choose to attend your school.

Lexis, Louise
Independent research project in physiology.

As part of a recently developed capstone program in physiology, we introduced a semester-long independent research project. This task was designed to promote the development of scientific research skills along with life-long skills such as critical thinking, problem solving, communication and interpersonal skills. In teams of 5-6 students, a research project is designed and implemented, and concludes with a team poster presentation, and an individual oral presentation and journal article submission.

Lloyd, John
Bio-Gerontology: the next course after A & P.

Bio-Gerontology, a course involving the biology of aging provides an opportunity for students to be exposed to the geriatric population. Individuals are living longer and the "baby boomers" are quickly approaching their "golden years". Aging, which leads to gradual changes in body composition, involves structural and functional losses at the cellular, tissue, and organ system levels. Chronic medical conditions such as hypertension, COPD, arthritis, coronary heart disease, and stroke have been associated with the aging process. Health care providers need to distinguish pathophysiological conditions from "normal aging" of the human body. Students in the course interact and observe elders individually at a local long-term care facility weekly and in addition they organize and implement a group activity for all the residents. Over the semester a human bond develops to the student and resident. As a Sioux Proverb states, "As you go through life, act in such a way as to not deprive others of happiness. Avoid giving sorrow to your fellow man, but to the contrary, see that you give him joy as often as you can." Selective student's reflections of their experiences with the residents along with action photographs will be presented.

Nielsen, Mark
Understanding fascial planes

An understanding of the fascial planes and fascial compartments of the body is critical to a large range of health care providers from massage therapists, to physical therapists, chiropractors, osteopathic doctors, and medical doctors. The fascial system defines the connective tissue continuity of the body and the clefts and spaces through which inflammation and infection can spread. For this reason, an understanding of the fascial system is of great therapeutic and clinical relevance. However, a clear understanding of this system is often not shared with our students. While the plethora of anatomical nomenclature associated with this system can be confusing, there exist clear patterns of structural organization, which if understood, can simplify and clarify the teaching and understanding of the fascial system. This presentation will cover these clarifying patterns and will illustrate how it can be used in diagnostic problem solving.

Paine, Robert
Teaching pathophysiology to a mixed-discipline student cohort.

In recent years we have reduced the number of our pathophysiology subjects from relatively small single-discipline groups of students to subjects with large numbers of students from multiple disciplines (physiotherapy, podiatry, nursing, etc). The intended outcomes, interests, and levels of understanding often differ amongst students enrolled in different courses, making it challenging to deliver discipline-specific content in a lecture format. This workshop explores the use of clinical case studies and "discipline specific workshops": to cover additional pathophysiology content to meet the specific needs of each discipline.

Rappazzo, Wendy
Tools for success: best practices in teaching and learning in STEM.

This workshop will present an overview of the best practices and tools shown to increase student learning and success in STEM courses. HCC has developed short modules used to increase student study skills, learning, and ultimately success in the classroom. These modules and current information on learning and memory will be discussed. Bring your own ideas and best practices to share.
Shmaefsky, Brian
The role of a general biology prerequisite in anatomy and physiology student success. There is much debate about the value of a general biology prerequisite for freshman level anatomy and physiology coursework. Many allied health programs that require A&P cannot add another course to their already jam-packed curriculum or list of prerequisite classes. However, A&P faculty generally would prefer students who were better prepared for the rigors of the biology conceptualizations needed for success in A&P. This presentation evaluates the role of college-level general biology as prerequisite for A&P. It investigates the effects of prerequisites on student success and describes faculty and student attitudes about the effectiveness of a biology prerequisite for achievement in A&P. Options tantamount to a biology prerequisite will also be discussed as well as upcoming best practices in career oriented biology courses recommended in the Vision and Change document developed by the American Association for the Advancement of Science with support from the National Science Foundation. The project in this presentation was the result of work done at the NABT and SCST 2012 Vision and Change Working Group funded by McGraw-Hill Higher Education.

Straud, Sarah
Moving A&P Outside of the Classroom: Outreach Events for Children
Interest in science begins at a young age. To promote and foster this interest, this year’s Anatomy and Physiology students were charged with the task of designing an outreach event targeted towards elementary school-aged children. In this workshop, I will discuss the overall logistics of the event and the types of activities that were presented. Saint Augustine’s University is a small, historically black institution. Because of our demographics, we chose to reach out to a group of underprivileged, African American male students. Games, demonstrations, and hands on activities were included in our two-hour long event.

Tucker, Bennett
Champions in the classroom—the process
Coach Nick Saban has developed “the process”, a way of life that has allowed the Alabama Crimson Tide to win the NCAA Football National Championship three out of the last four years. We really should ask ourselves: “What is it about Nick’s “process” that creates such a championship mentality”? Closer examination of the tenets of this process reveals a formula for success that is far from exclusive to football. We as A&P instructors can adapt this methodology for proven success and use it to help create champions in our classrooms.

Tucker, Bennett
Preventing rejection of the transplant Coach Barry Switzer, referring to an athlete, was quoted as saying, “It was like a heart transplant. We tried to implant college in him but his head rejected it”. If we look at the body of knowledge we want to “implant” into our students, we must ask this question: How do we prevent rejection? What are the factors and contributing factors that could lead to rejection, and what can we do to improve the chances of our “transplant” becoming successful?

Tucker, Bennett
Diamonds in the rough: unearthing pre-medical, pre-dental, and pre-optometry students.
We are around these students every day, but are we aware of their potential? What should we see that would indicate these students could be diagnosticians? Do we see, hear, and notice traits that are essential to taking care of patients? Is there a “Dr. House” in the house? What can we, as A&P instructors, do to help point these students in the right direction? How can we be instrumental in helping them reach higher than they ever thought they could reach?

Tucker, Bennett
Using the bible to illustrate anatomy and physiology concepts.

From the dry bones in Ezekiel to King Solomon’s review of human body systems in Ecclesiastes, Biblical history proves to be a great adjunct in classroom A&P instruction. As we dissect these passages, we can capture anatomical and physiological writings dating to 1400 B.C. and use them to establish relevance of our instruction to the clinical careers that our students desire.

Tucker, Bennett
Why does a patient with a stone in the cystic duct not jaundice: nuts to know - really?
It has been suggested A&P instructors should teach basic topics (need to know) and maybe a few extras (nice to know), yet stay away from contributing topics that could be deemed “nuts to know”. Could it be that extraordinary learning begins when a student asks, “Why doesn’t he turn orange?” We, as instructors, can use correlating topics to uncover the pearl that, once learned, can stimulate our students to be relentless in their academic preparation. It’s not “nuts” if it helps create insatiable learners.

Veil, Carol
The fine art of transforming your students into “Anatomy & Physiology Nerds” — round two.
Join me for a follow-up to last year’s presentation in Tulsa, with all new content to nurture those A&P Nerds in your classes. What are A&P nerds? They are individuals who are fascinated to see the application and the true beauty of A&P in every aspect of their lives, much to the bewilderment, amusement, and sometimes disgust, of family and friends. Get ready for more examples of music, art, humor, and great stories to enhance your teaching and, step by step, turn your students into true A&P nerds.
EDU-Snippets: Bones, Art Work, Excitation, and Neurotransmission

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

Roberta M. Meehan
Maricopa County Community College District
Phoenix, AZ

biology@ctos.com

EDU-Snippets is a column designed to let you, the members of HAPS, share your “ways to make sure your students get it.” Since EDU-Snippets began, our members have been continuously amazed at how many teaching and demonstration ideas pop up and are easily transferred from one instructor to another through Snippets. This edition is no exception. As a matter of fact, this issue is exceptional! Hopefully you will be able to utilize what our colleagues have submitted.

As you know, this is the Conference Edition. The other articles and columns in this issue of the HAPS-EDucator all relate to this past Conference held in May in Las Vegas. We thought that for EDU-Snippets we would invite the members not just to relate to this Conference, but to relate to any Conference they had attended or had heard about. We asked people how they applied the Conference material to their classrooms or laboratories. The results were phenomenal! Most of the submissions relate directly to a Conference presentation; a few relate indirectly. All are fascinating. Hopefully everyone will be able to utilize in some fashion what our members have contributed.

I. A’n’P at the Boys Club Snippet

Sarah Straud (St. Augustine’s University, sbstraud@st-aug.edu) sent in the following. The quote is from the Huffington Post and part of the article – entitled “Anatomy and Physiology Day at the Boys Club of Raleigh” – was written up for the St. Augustine’s University paper.

“Black people are 12 percent of the U.S. population and 11 percent of all students beyond high school. In 2009, they received just 7 percent of all STEM bachelor’s degrees, 4 percent of master’s degrees, and 2 percent of PhDs, according to the National Center for Education Statistics.” - published in the Huffington Post, October 2011

On November 29, 2012, students in the School of Sciences, Engineering, and Mathematics presented a small science workshop for first through third graders, primarily African American males, at the Boys Club in Raleigh. African American men remain scarce in the fields of Science, Technology, Engineering, and Mathematics (STEM), with one contributing factor being the lack of mentors of color. Students at Saint Augustine’s University saw an opportunity to make an impact that could, in the near future, potentially increase the number of African American males to become doctors, dentists, pharmacists, and engineers.

Students who participated in this event included: Derrick Williams, Jr., Richard Gilliam, Lauretta Ihenatu, Adaeze Egolum, Tanisha Perry, Chamoine Blakeney, Moryelle Coley-Greene, Alexander Tucker, Shonquez Nelson, Martize Smith, Cherisse Lynch, and Ty-Reak Murray. Supervised by Dr. Sarah B. Straud, Assistant Professor of Biology, this was the first ever STEM day held at the Boys Club. The main goal of the event was to excite and expose minority youth to the field of Anatomy and Physiology. The boys were able to isolate DNA from a banana, “meet” the bones of the body, conduct a taste test in which they were blindfolded before

(Continued on next page)
testing, and engage in an interactive “human red blood cell” game. The boys also got to see what real organs look like, including the liver, lungs, heart, and small intestines, stomach, and brain. They were given pairs of gloves and were allowed to examine body organs for themselves. “Students were enthusiastic and had a lot of fun. There were plenty of questions. About half the kids couldn’t wait to hold the organs; the other half kept saying, “Ewww. That’s gross!”

“Those boys now know that DNA is an important molecule found in their bodies, and that it stands for deoxyribonucleic acid. They were able to tell me what a long bone was, and why a brain contains its ‘wrinkles’. One little boy told me that he met “Sacrum” (bone found in the pelvic region of the body),” said Dr. Straud. “Our students were the driving force behind this event. They chose the topics they were going to teach, got all of their own supplies, consulted other professors for reagents and advice, and most importantly, they worked together to pull off one terrific event. The level of creativity I saw was amazing.”

II. Membrane Transport Snippet
Karen Groh (Good Samaritan College of Nursing and Health Science, karen.groh@email.gscolllege.edu)

When students are studying membrane transport, they are often puzzled by the difference between a channel protein and a carrier protein, so I have found a simple way to demonstrate this concept to them. I have a student volunteer act as a molecule. I tell the student to step outside of the room. I then stand in the doorway while propping the door open.

First, I act as a channel protein. I tell the student to walk into the room. As the student walks past me, I do nothing but watch the student walk by, explaining to the class that channel proteins do not interact with the molecules as they diffuse into or out of the cell.

Next, I have the student leave the room again. I then tell the student to walk back into the room, but this time, I take the student’s hand in mine and guide the student through the door, explaining to the class that carrier proteins interact with molecules as they pass into or out of the cell, changing shape before releasing the molecule to the other side.

This demonstration is a simple but effective means of demonstrating the nature of channel and carrier proteins in cell membranes.

III. Sexual Identification Snippet
Robert Mehan (Maricopa County Community College District, biology@ctos.com) decided to lead the parade of Conference Snippets by talking about one of her many favorite workshops. This one from Calgary in 2004 was presented by Valerie O’Loughlin.

Whenever we study the skeletal system, students always want to know how to tell male skeletons from female skeletons. We all know the standard rules about the pelvic girdle and the forehead. I had always thought there must be a series of more accurate ways to distinguish the skeletal sexes. There had to be more to it! After all, haven’t we all run into a pubic angle that is exactly 90 degrees? Or ilia that forgot to read the book on whether they should be more straight or more flared? We know there are always anomalies and it is nice to remind the students about that. But, I always used to think there were more and better definitive ways to differentiate between the skeletons.

So, I went to Valerie O’Loughlin’s workshop. That was absolutely marvelous! I hadn’t realized there were so many skeletal points and markings that could be studied, graded, and then looked at as a whole to determine whether a skeleton was male or female. No more single point identification but rather a series of markings that could be evaluated together. Valerie had worksheets and bones for us so that we could practice grading the different markings. We could also work together to determine what we had. Everything is not immediately clear. Nevertheless, when the results are added up (after practicing), we could be quite certain of the sex of the individual. This is so much better than the few, often difficult to discern, markings we are all so used to dealing with.

I came away from the workshop with a stack of papers, a new appreciation for what the average person can do, and a head full of ideas for an anatomy lesson or two.

IV. Tiny Tim’s Snippet

In Tulsa in 2012, Anna Ross (Christian Brothers University, aross@cbu.edu) went to the “Tiny Tim” Workshop, presented by Sandy Zetlan and Marsha Segerberg of Estrella Mountain Community College. The write-up on this Workshop was as follows: “No more expensive cadavers, cats, or plastic models. Students learn muscle origins and insertions, and derive actions, by applying clay strings to small plastic skeletons. You will extrude clay, build muscles, and get access to our muscle website, crib sheets, and printable flash cards, while utilizing existing on-line animations to learn to teach muscle anatomy in a hands-on, inexpensive, and renewable way suitable for in-class or online learning.” Anna went on to explain what she did once back in Tennessee.

The “muscles in clay” lab activity is something I’ve had my eye on for several years, having seen the vendor at several HAPS Conferences. But the name brand models are way too expensive and muscle construction looked too time consuming and seemed to require a lot of artistic ability from students. Then I attended a workshop at the May 2012 HAPS meeting in Tulsa where I learned that Drs. Zetlin and Segerberg had developed a cheaper version, using the Tiny Tim skeleton.
(about $25.00 each) and strings of clay (instead of sculpting more realistic looking muscles as in the expensive version). They even have a website that shows ~60 muscles constructed this way. These can be seen at Feets of Clay http://www2.estrellamountain.edu/muscleclaydb/

After having the opportunity of trying it during the workshop and seeing the detailed website available, I decided I could make this work for my A&P course.

As soon as I returned from HAPS last summer, I bought (from Amazon) 14 of the skeleton models, 4 clay extruders and a roll of white art paper to cover the lab benches. I bought good quality plasticene clay from a craft supply website. I then modified my A&P Supplement and syllabus to substitute this lab activity for cat muscles in Biol 217 lab. During the muscle anatomy lab sessions in my fall 2012 A&P I course, each A&P student constructed a few assigned muscles at a time (specified in team handouts based on the “Feets of Clay” flashcards) and using a small model skeleton. Then the students examined each other’s models and identified the names and actions of the muscles other students constructed. Students also used our human muscle models and the lab manual as additional references. We had time for several rounds of muscle construction, each followed by a “practice practical.” The A&P students really enjoyed the hands-on lab activity and befitted from practice learning the names and actions of human muscles.

Here are some photos of my students in action http://facstaff.cbu.edu/aross/APIhome.htmL8_9 I’ve recently purchase two more “Tiny Tim” model skeletons to accommodate the additional students enrolled for next semester and I’m looking forward to our next muscles in clay lab.

V. Exam Planning Snippet

Pat Ratliff Eastern (Oklahoma State College, pratliff@eosc.edu) also went to Tulsa in 2012. Pat attended a workshop on planning exams – one of those things we all tend to dread! Here’s what Pat said:

I’ll admit that before this workshop, I slapped together tests without a lot of forethought and they wound up being brutally hard. The presenters in this workshop showed how to plan your exams before you write them so you have covered the categories you consider important, then make sure there are many more knowledge-based questions than comprehension and application questions, as is appropriate for my sophomore-level course.

I also went a step further. As I write each test, I look at the results from the previous semester’s test and modify the multiple-choice questions that >65% of the students missed. The result has been improved consistency, so that a student making a B on every other assignment now also earns a B on the test (uh, instead of the C or [gulp] the D they would have earned before).

VI. Attention Getting Snippet

Janet Casagrand (University of Colorado at Boulder, janet.casagrand@colorado.edu) went to a Las Vegas presentation dealing with a problem many of us have encountered – returning student attention to the instructor after a student discussion. We do not want to lose the momentum but we certainly do want the class to re-focus. Janet told us what she learned.

Sometimes when you have students talk among themselves (for example, for a think-pair-share activity, or a case study discussion, etc.), it can be a little difficult to get the students’ attention back. One of the ideas that I came back with from the conference in Las Vegas, was a technique for quietly returning the attention of the audience/class back to the speaker/instructor. During his presentation on POGIL (“Process Oriented Guided Inquiry Learning (POGIL): A Student-Centered Approach to Science Instruction”), Richard Moog had the audience engage in some POGIL activities. Before starting the activities, he told the audience that he would raise his hand when he wanted attention back. He asked anyone who saw him raise his hand to do the same. As people saw the raised hands, they realized they should quiet down and focus back on the speaker. This process continued until the whole group was quiet again. This seemed to work really well, and is definitely a technique I want to try with my students, especially in my larger classes.

VII. Loop of Henle’s Snippet

Kathleen Weiss (George Fox University, kweiss@georgefox.edu) went to Victoria in 2011 and came back with some interesting ideas.

I went to a workshop on creative ways to help students understand and remember concepts. I still use several of the things I learned there, although I may have modified them some.

1. Heart valves can be demonstrated with the opening and closing of a door. The blood can push the door open if the pressure is higher than the door’s resistance, but when the pressure drops the blood outside starts to flow back closing the door. I slam the door if I can (those auto-closers slow me down!) and I emphasize that the noises we hear listening to the heart are the “doors” slamming. Teaching it this way, I end up with most of the nursing students actually knowing that S1 & S2 are valves closing, whereas they didn’t in classes I taught without the demo.

2. The Loop of Henle demo is one that is more complicated. I explain to the class a loop of Henle going away from the board towards the first row of seats around a narrow table sticking out from the board. On the table there are tootsie-roll pops increasing in number as the table gets closer to the class. This represents the osmotic gradient of the renal medulla. Then I have 4
students walk the “loop” – each with 3 tootsie-roll pops in hand. As they go “down” the loop, one by one they leave, handing the candy to one remaining student in the loop. The students are water and the pops represent solute with each pop being 100 mOsm – so the initial fluid is 300 mOsm and at the bottom of the loop the lone student has 12 pops = 1200 mOsm. The lone student turns to ascend the loop, depositing pops on the table to end up with only one pop at the top of the loop = 100 mOsm. The demonstration can be continued showing the vasa recta picking up pops as it descends and laying them down on ascent. I know this sounds complicated, but it has really helped with understanding a difficult concept, at least with some students.

VIII. Blood Typing Snippet

Way back in 1994 in Portsmouth, NH, our infamous David Evans (devans@pct.edu) and his lovely wife Henriette Evans (hke100@psu.edu), both of the Pennsylvania State System gave a husband and wife presentation and then wrote it up in the HAPS newsletter, the predecessor of the HAPS-EDucator. David then went on and presented their idea at Eastern Regional meetings in Delaware and Pittsburgh.

Here is our idea: Use livestock blood in hematology labs. You can do anything with citrated livestock blood that you can do with citrated human blood: smears, hematocrits, Hb concentrations. You can sometimes get an interesting type reading from animal blood too. (Most mammals seem to be O+ but I got a spectacular A+ from a dog once!). You can choose the species you wish and be certain you are avoiding HIV.

It is cheapest, usually free, to go with dog blood since a friendly local veterinarian will probably be glad to provide citrated dog blood samples—they draw a lot of specimens when doing heartworm tests. An advantage of the veterinary dog samples is that you will also avoid rabies and a few other “germs” that vets vaccinate their patients for. Nevertheless, universal precautions must be observed—you just never know!

IX. And We Hope You Will...

Keep those cards and letters coming! Thank you all for your EDU-Snippet contributions. As you can see, the influx of Snippets this round has been exceptional! Please keep it up because more are always needed! Maybe reading some of these Snippets has sparked your memory about something from a by-gone Conference. Or maybe you have remembered something else you tried or something you would like to try. Your ideas are always tremendous! If you have thoughts or ideas, or any interesting ways to help our students understand anatomy and physiology, EDU-Snippets would love to hear from you! Once again, EDU-Snippets encourages new submitters to submit – and regulars to keep on submitting!

For the next issue of the HAPS-EDucator, send your EDU-Snippet experiences and ideas to biology@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!
Teaching human anatomy: an evolutionary perspective

Beginning students in anatomy & physiology are often overwhelmed with new material and struggle to organize the volume of information. Teaching and learning research in biology and other disciplines makes it clear that students learn disciplinary content better when it is presented in the context of the organizing theories of the discipline. In most A&P textbooks, the fundamental organizing theory of biological evolution is conspicuously absent, depriving students of an effective framework for learning. This presentation demonstrates how to apply an evolutionary perspective to human anatomy using the example of human dentition. Beginning with comparative anatomy of the form, arrangement, and development of human dentition, we show how to construct a cladogram of the nested hierarchy of traits that illustrate the phylogenetic relationships among species. From this example, we demonstrate the importance of understanding evolutionary relationships when learning and teaching modern human anatomy. Teaching human anatomy from an evolutionary perspective can be both effective and informative both for helping students to learn anatomy better and to understand the role of the evolutionary history of our species in shaping contemporary human form and function.

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Using cultural examples to build relevancy in human anatomy and physiology courses

Beginning in 2006 the National Academy of Sciences, including the National Institutes of Health and the National Science Foundation, began an initiative to promote increased diversity in the education and training of professionals in the fields of science, technology, engineering and math. Despite these efforts minority populations remain underrepresented in today’s medical and scientific workforce. Cultural differences of worldview, learning styles, and modes of communication are seen as contributing to the low rate of student success in scientific fields. The cultural disconnect between the presentation of scientific material in textbooks and classrooms and the worldviews and experiences of minority students can often lead to a lack of relevancy and immediacy for the student, which compounds with long-held biases that X minority group is “no good at science”. Science educators working with minority students face the challenge of presenting scientific material in a way that fosters relevancy and immediacy. This poster presents some pedagogical tools to build cultural relevancy, and provides examples of using cultural references within the context of a human anatomy and physiology course for Alaska Native students.

Exploring the use of competition-based technologies in the classroom

Whether students are competing with others for scholarships or spots in medical schools or competing against themselves for higher grades on examinations, the competitive nature of post-secondary education is undeniable. The literature regarding the use of competition in a classroom setting is often described as being an effective motivator for success, both amongst students and self-within. We will be exploring the effectiveness of an online game based tournament that is competitive in nature. Students are paired randomly and compete head-to-head against each other in an effort to answer questions with both speed and accuracy. 1.0 mark is assigned for each correct answer and an additional 1.0 mark is awarded to the participant with the faster response time. Students will then be ranked amongst their peers. We want to determine if the use of game based competition encourages students to familiarize themselves with course material prior to the exam, as well as investigate if knowing one’s rank among the participants prior to the examination will affect student motivation. Preliminary data shows that students find the tournaments both engaging and motivating. Students enjoy the competitive nature of the tournaments and appreciate being able to prioritize their time reviewing exam material based on their achievement in the tournament. We anticipate that the tournaments will encourage students to not only prioritize their studying, but to also exercise the self-within competition that is the basis for personal achievement on exams.

Jennifer M. Burgoon
The Ohio State University, Columbus, OH
jennifer.burgoon@osumc.edu
Learning anatomy through dissection: graduate student involvement in a full-body dissection course for undergraduate students

In an effort to provide additional opportunities for anatomy graduate students to advance, apply, and reflect on their developing teaching skills, a two-semester teaching practicum course was designed to meet the needs of the graduate students, as well as the division. During the spring semester, graduate students with an interest in teaching register for one credit of teaching practicum and help design, organize, and prepare for an undergraduate human anatomy dissection course to be conducted during the summer session. During the summer, the graduate students register for a second credit of teaching practicum and serve as the primary instructors for the course, being assigned a team(s) of four undergraduate students and a cadaver(s) to fully dissect under the direction of the graduate student. The cadavers dissected during this course are being prepared for use in future undergraduate anatomy courses that utilize prosected cadavers in the laboratories and will be the cadavers a number of the graduate students will use in their future teaching opportunities. During the summer dissection course, the graduate students also share in duties such as delivery of pre-laboratory presentations that serve as an overview to begin the laboratory sessions. The graduate students write daily in a journal after each class to reflect on their teaching answering such questions as ‘what do I do well?’ and ‘where can I improve?’, as well as provide a final reflection on the student evaluations of their teaching at the end of the course.

Janet Casagrand
University of Colorado, Boulder, CO
Janet.Casagrand@colorado.edu

Effectiveness of in-class worksheet activities for improving learning of electrochemical forces and equilibrium potentials

One especially challenging set of concepts for physiology students to grasp is electrochemical forces, equilibrium potentials, and ion flow. These concepts provide the basis for understanding electrical signaling in the body (e.g., membrane potentials and changes in membrane potential due to the ion flow that results from electrochemical forces). Difficulty in understanding these fundamental concepts can consequently act as an instructional bottleneck for students to progress in their understanding of nervous system function. In Spring 2010, I taught a large, upper division Human Physiology course. These core concepts were introduced in lecture. Students then practiced with the concepts with several in-class clicker questions and out-of-class homework questions. However, in talking with students and looking at their exam performance I realized they were not grasping the concepts as well as I would have liked. The next two semesters, I incorporated in-class worksheet activities on these concepts to see if they could improve learning. The worksheet was designed to be completed in-class, so I or the undergraduate teaching assistants could provide feedback and answer questions. Student reaction to the worksheets was very positive, but did they improve learning? Was it worth the loss of lecture time? To determine this, I administered in-class clicker questions before and after the worksheet activity, and also quantified exam performance for semesters with and without the worksheet activity. The results indicate that the activities did significantly improve learning both immediately after the activity, as well as several weeks later on the exam.

Michel Désilets
University of Ottawa, Ottawa, ON, Canada
mdesilet@uottawa.ca

Co-Presenters: Yanic Legault, yanic.legault.1@ulaval.ca, Anissa Hamel, ahame060@uottawa.ca

Self-Learning Physiology through the Use of Integrated Virtual Laboratories

Teaching of physiology to large-size classes is often done in a purely theoretical manner, without hands-on labs to apply and consolidate the acquired knowledge. This problem can be alleviated by the use of integrated simulation programs, such as “HumMod” (University Of Mississippi Medical center) and web-Human (Skidmore College). By allowing flexibility in setting the physiological parameters and in designing the experimental protocols, these programs further constitute potentially valuable self-learning tools. The project consisted of developing such self-conducted virtual labs that could complement the formal lectures and allow further exploration of human physiology. Various simulations related to cardiovascular physiology were initially presented as specific observations that students had to explain after planning and conducting their own experiments. Examples of questions: Explain the observed increase in pulse rate induced by exercise, by hemorrhage, by hyperthermia. In addition to evaluations of labs reports, surveys were conducted to assess students’s interest and perception of the virtual labs. Overall, the majority of the students (n = 470) agreed that the virtual labs enhanced their comprehension of physiology and stimulated their interest. A significant portion of them further contemplated a future use of the virtual labs for their own personal formation. Thus, the self-conducted virtual labs proved to enhance the comprehension of physiology while creating a genuine interest for experimental physiology.

Mark Hubley
Prince George’s Community College, Largo, MD
mhubley@pgcc.edu

Co-Presenter: Bekki Zeigler, zeiglebx@pgcc.edu

Using computers to replace microscopes in the anatomy and physiology laboratory

Students of anatomy and physiology have traditionally used microscopes to study tissues. While we value microscopy, our department had various concerns about using microscopes in the A&P laboratory. These concerns include (1) costs to the department to maintain microscopes and slides, and (2) time...
spent helping students use their microscopes. The heads of our allied health and nursing departments told us that microscopy is a skill of little use in the careers of the majority of our students. Thus, our department considered replacing microscopes with computers for online viewing of digital images. In fall 2008, half of A&P I classes continued the use of microscopes in the laboratory; the other half used computers. Student performances on exam questions related to histology were compared, and no significant differences were observed between the two groups. We surveyed students’ attitudes about the histology portion of the laboratory, and again no significant differences were observed. Given these results, the department discontinued the use of microscopes in the A&P curriculum in 2009. The primary justification was cost savings. The switch from microscopes to computers also freed the staff from time spent maintaining microscopes and slides used for A&P. Although some faculty had regrets, most adapted quickly and enjoy discussing histology without the distraction of students having difficulties operating microscopes. Four years after the change, the department is satisfied with the results.

Vasiliy Kolchenko
New York City College of Technology, Brooklyn, NY
vkolchenko@gmail.com
Co-Presenter: Olufemi Sodeinde, osodeinde@citytech.cuny.edu

A model of faculty collaboration: the departmental Instructor’s Guide for undergraduate Anatomy and Physiology labs

The need for instructional improvements in undergraduate Anatomy and Physiology labs presents a challenge, especially in multiple-section courses. Additional modification requests by Nursing and Radiology Technology programs made our curricular and pedagogical review more urgent and specific. NSF-funded institutional I3 project for STEM lab enhancement stimulated the effort to develop the departmental Instructor’s Guide that brought together Anatomy and Physiology faculty and summarized their pedagogical expertise. We developed the template for the weekly Instructor’s Guide and collaborated on sharing instructional materials and resources and identifying potential problems and best practices in the labs. The collaboration focused faculty attention on lab improvement and generated productive forms of professional development. It helped us modify and enrich our teaching routines and make student lab experiences more engaging and efficient. It also rekindled the spirit of inquiry and experimentation in the classroom and brought up unexpected questions about updating our curriculum. The Guide is course-specific and follows the existing syllabus. It is disseminated online and continuously updated. The model of faculty collaboration was also utilized by Microbiology and General Biology instructors at City Tech.

Augusthy Kulakkattolickal
Harold Washington College, Chicago, IL
Augusthyk@gmail.com

Customizing teaching anatomy and physiology to students who do not have the required prerequisite biology course

Every semester, I face the challenge of teaching students who get enrolled in Anatomy and Physiology I (Biology 226) course at the City Colleges of Chicago without having the recommended prerequisite course (Biology 121-Cellular and Molecular Biology with lab). Based on the data collected through a Prerequisite and Career Goal Survey conducted in six classes on the first day of class during past two semesters, only 52.94% students had the prerequisite. Students coming from outside the City College Systems claim that their biology course elsewhere is equivalent to Biology 121. On the first day of class, I assess their knowledge in biology by conducting a Prerequisite Knowledge Assessment Test (PKAT). PKAT consists of 100 customized multiple choice questions from various topics covered in Biology 121. I motivate students assuring that 10% of the points they earn in PKAT will be added as extra credit to the final total at the end of the semester. Based on the PKAT tests of 184 students, the scores ranged from 29% to 77%. The average score was 48.3%. The results of the career goal survey of 187 students conducted on the first day of class during fall 2012 and spring 2013 semesters showed that they had 21 different career goals. Their five major goals in priority were 54.55% Nursing, 11.76% Medical School, 6.42% Physician Assistant Program, 4.81% Physical Therapy and 4.81% Pharmacy. The PKAT test scores and the survey results help me plan my instruction by maintaining the set high standards for my students.

Stuart McDonald
La Trobe University, Bundoora, Victoria, Australia
Stuart.McDonald@latrobe.edu.au
Co-Presenters: Tom Samiric, T.Samiric@latrobe.edu.au, John Schuijers, J.Schuijers@latrobe.edu.au

Using case studies to develop deeper learning of physiology theory

Case studies are a widely used technique for developing and reinforcing active learning. We report on our experience of promulgating a series of inter-connected case studies undertaken by students in small groups during weekly workshop classes. The questions associated with the case studies required students to apply knowledge previously presented in lectures/texts in order to work towards a higher order of understanding of key physiology concepts. This was assessed by developing intermittent case study assessments each with questions designed to measure three tiers of learning: recall, application and critical thinking. We also report on the methods we used to improve student performance throughout the case studies and associated assessments.

Rachel McTavish
University of Wisconsin, Milwaukee, WI
McTavis2@uwm.edu
Co-Presenter: Andrew Petto, ajpetto@uwm.edu

Diagnostic Teaching in the Anatomy Lab

(Continued on next page)
Even with tried-and-true lessons, students sometimes struggle to master basic material that is required as a foundation for ultimate success in a course. For students in the Anatomy and Physiology 1 laboratory, one of the major objectives is to recognize and identify successfully the tissues of the human body so that they can apply these skills to understand the cellular basis of human form and function. For students persistently struggling to succeed in meeting this objective, we implemented a process known as diagnostic teachings. In this process, instructors observe students as they attempt to solve problems focused on the course objectives, asking questions to understand how students are choosing what information is relevant and how they are applying it to the problem at hand. Instructors do not correct the errors per se, but ask focused questions to help students identify the issues that are at the basis of their poor performance. Sometimes this issue is a lack of knowledge, but other times it is the need to develop a strategy for recognizing appropriate resources and applications and to learn how to implement them; in other words, developing a student’s plan of action for mastering the material. This student-centered practice’s helping students to focus on how they learn and understand the materials improved quiz and exam performance significantly. Instructors also used the feedback to modify some of the instructional practices in the lab section.

James Montante
Oakland University, William Beaumont School of Medicine, Rochester MI montante@oakland.edu
Co-Presenters: Mary Bee, bee@oakland.edu, Rami Nazar, University of Detroit Mercy, Detroit, MI

Experiential learning as a mechanism to drive learning in the classroom

Service learning is a form of project-based learning that enhances the student’s assimilation and integration of the course material in a way that is not possible in the classroom. In service learning, the motivation for taking ownership of the project is the act of helping other people, which is relevant to students in health care fields. Our service learning project involved university students presenting anatomy material from their lecture course to high school and middle school students in the urban environment. The program was very successful. University students gained experience in presentation skills, an appreciation for teaching in the urban environment, and the depth of knowledge that only comes from teaching. Students in the client institutions were able to see that the material taught in their course is relevant and valued outside of their classroom and that people from different ethnic and social economic groups can work together to accomplish something worthwhile. Urban students at the client institution scored significantly higher.

Melissa M. Quinn
The Ohio State University, Columbus, OH quinn.269@osu.edu
Co-Presenter: Jennifer M. Burgoon, jennifer.burgoon@osumc.edu

Learning anatomy through dissection: undergraduate student involvement in a full-body dissection course

In a typical undergraduate anatomy curriculum, there are not many opportunities available for students to perform a full-body human dissection. Many anatomy courses offered to undergraduates do not have a laboratory component, have a laboratory component but utilize only models and/or cat dissections, or have a laboratory component with access to only prosected human cadavers. During the fall and spring semesters at The Ohio State University, undergraduate students registered for anatomy courses have the opportunity to work with prosected cadavers but a question asked often has been, “Is there any opportunity for us to do a dissection?” It was from this ongoing student request that during the summer session of 2011, an undergraduate summer dissection course was first implemented to provide selected undergraduate students, in groups of four, the opportunity to prepare the following academic year’s fully prosected cadavers. To be a participant in the summer dissection course, students had to go through an application process and, once selected, were instructed by an anatomy graduate student as they completed a full body dissection. Students met for class 9 hours a week for over 5 weeks to prepare the cadavers. The course included students in health related majors, many of whom were interested in attending professional school (e.g. medical or dental school) or graduate school. The course was offered again in the summer of 2012 with a noticeable increase in student applications and is currently being prepared for the summer of 2013.

John Robertson
Westminster College, New Wilmington, PA
robertjc@westminster.edu

A Peer Education Project in an Anatomy and Physiology Course

This poster describes a peer-education activity in which small groups of students focus on biomedical issues that have a strong relation to Anatomy & Physiology course content. Student groups first select and research an appropriate issue (e.g., use of tanning beds, HPV vaccination). They then develop and administer a survey to assess peer knowledge of and attitudes toward the specific issue and underlying biology. After collecting data, groups analyze and interpret findings, with an emphasis on considering how understanding and attitudes impact clinical dimensions of the issue. Groups must devise specific strategies to help effectively provide information on the issue in light of their results. Students produce posters of their work that they present in a public forum. Assignment goals include: 1) reinforce course themes and material, 2) synthesis and integration of information in a clinically relevant framework, and; 3) engage in creative professional collaboration. In addition to elaborating on outcomes and providing a detailed overview of the assignment, examples of group projects and results will be presented. Also included are results of assessment of student reaction to the project.

Co-Presenter: Jennifer M. Burgoon, jennifer.burgoon@osumc.edu

(Continued on next page)
Using the past to teach the future: analyzing runaway slave advertisements as an indicator of health and welfare of antebellum slaves

John, an African slave, ran away from the jail in Twiggs County, Georgia, in 1838. Bearing the scars of whipping, this "very smart" man elected to escape a jail and take the chance of regaining the freedom he lost upon being declared a slave. John's story, unfortunately, is not a new one. The plight of slaves as shown by runaway advertisements posted in the newspapers has been analyzed to determine many details about the runaways. Age, sex, occupation, who travelled together, and where they started in their running are examples of these details (Costa, 2001; Schafer, 1981). In contrast to previous analyses, this research project focuses on an untapped analysis of these ads to determine the health and welfare of runaway slaves and enslaved people in general, in the antebellum South. The primary source to be analyzed is newspaper advertisements for runaway slaves from Baldwin County, Georgia, in the antebellum era. Secondary sources included journal articles on reading and interpreting runaway slave advertisements, articles and book chapters on slave buying and on slave health maintenance, an autobiography of an escaped slave and a journal of a plantation owner’s wife while living on a cotton and rice plantation in Georgia. Advertisements for twenty-six runaways were examined to establish their health and welfare from characteristics mentioned in the ads. This historical information can be used to teach anatomy and physiology students today because it is a way of applying the terminology and concepts learned in classes to real people, like John's, situations.

Heather Rudolph
University of Georgia, Athens, GA
hrudolph@uga.edu

Using videos to understand difficult concepts

To help students understand tough concepts, short videos are often used in class to create a visual of the concept and to show how concepts are connected. Students in Anatomy & Physiology II created videos to help them understand difficult concepts, which allowed for reinforcement and broadening of the course concepts. The topics covered in the videos were osmosis, the bones of the skeletal system, and the layers of the skin. Each group was tasked with creating a video that compared the concept to something they would encounter outside of the classroom. Feedback was collected via anonymous survey. 100% of the students in the class felt that their understanding of the topic covered in the video increased by watching each of the videos. When asked if this project should be used in future classes, again this was met with 100% agreement. One of the comments received in response to keeping the video project in future classes was as follows: "It was effective because everyone had to do research on the topic which made us learn a lot more." Feedback in response to if making the video was helpful included, "Although watching the videos was helpful, making them was what really helped me. Focusing on one topic and coming up with a way to illustrate it really reinforced it in my mind." Not only will these videos be shown to future Anatomy & Physiology classes when the concepts come up but also in other classes when the course material overlaps.

Rema Suniga
Ohio Northern University, Ada, OH
r-suniga@onu.edu
Co-Presenter: Vicki Motz, v-motz@onu.edu

Expanding student-based inquiry beyond the classroom

Proper implementation of student-based inquiry expands students’ experiences far beyond the classroom. Student-directed group research in the Medical Physiology laboratory at Ohio Northern University enhances critical inquiry through application of physiological concepts. With instructors’ guidance, students conduct a literature review on a current topic, submit a research proposal with IRB or IACUC paperwork, conduct experiments, analyze data and present findings to their classmates. Student groups are encouraged to present their research at scientific meetings. A group of students investigating the “Effects of Texting While Driving on Reaction Time” exemplify the far reaching outcome of such student research. Upon reading the published abstract of the podium presentation of this research at the Ohio Academy of Science (OAS) meeting, a member of the Ohio House of Representatives invited our students to report their results as testimony during hearings on legislation to ban texting while driving. After conducting a follow up study examining cardio-respiratory rates as a measure of stress during texting while driving, the students compiled the combined results into a manuscript recently published in The Ohio Journal of Science. A subsequent student group implemented creative manipulations to the ADI data acquisition system to more closely mirror the driving experience, to address the “Positional Effects of Texting While Driving on Reaction Time”. Their results will be presented at the 2013 OAS meeting. With continued mentoring, the critical thinking and communication skills that students acquire in this laboratory extend well beyond the classroom, thus, highlighting the importance of this learning tool.

Benjamin Addicott
addicott@hawaii.edu
University of Hawaii, Honolulu, HI
Co-Presenters: Marie Nguyen, marie29@hawaii.edu, Patrick P. Pedro, patrickp@hawaii.edu

Common Celliacomesenteric Trunk Presenting with Mesenteric Ischemia: 2 Case Reports with a Review of the Literature

We present two cases demonstrating variant branching of the abdominal aortic trunks along with radiographic

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imaging and correlation to a common disease state. The first case is a 67 year old female who presents with abrupt onset of rapidly worsening abdominal pain. Computed Tomography demonstrated pneumatisosus intestinalis with air in the hepatic portal system and superior mesenteric veins. A celiacomesenteric trunk (CMT) was noted to originate from the aorta at T12 replacing separate superior mesenteric artery (SMA) and Celiac Trunk (CT). The patient was taken for exploratory laparotomy which revealed a 60 cm length of ischemic bowel which was resected. The second case is an 88 year old gentleman with recurrent GI bleeding accompanied by severe abdominal pain. Enteroscopy revealed a dusky section of the proximal duodenum with bleeding duodenal ulcerations which are pathognomonic for chronic mesenteric ischemia. Angiography demonstrated CMT with high grade stenosis. The CMT was stented open improving flow and reperfusing the bowel. In each of these examples of mesenteric ischemia, CMT was noted as an incidental finding on CT. Collateral circulation between SMA and Celiac artery is an important safeguard protecting against mesenteric ischemia. CMT is a rare variation reported to occur in less than 1% of the population and is associated with an intrinsic loss of SMA-CT collateral circulation. These cases together with a review of literature and discussion of the embryologic development introduce a mechanism and provide anecdotal association between CMT and a predisposition to mesenteric ischemia.

Nawwar Al-Qaysi
nawar_808@yahoo.com
UKM, KL Wilayah Persekutuan, Kuala Lumpur, Malaysia

**Effects of curcumin on osteoid activity in an ovariectomised rat model**

**Purpose:** Osteoporosis is a metabolic disease affecting both men and women, especially postmenopausal women. Curcumin extract has been shown to influence bone metabolism in male rats. The aim of this study is to determine the effects of curcumin extract on osteoid, the newly formed bone in ovariectomised rats, a postmenopausal osteoporosis model. Methods: Forty female rats were divided into five groups, namely: group I sham operated and fed with normal diet and vehicle (palm oil), group II sham operated and fed with normal diet and curcumin extract (110 mg/kg), group III ovariectomised and fed with normal diet and vehicle (palm oil), group IV ovariectomised and fed with normal diet and curcumin extract (110 mg/kg), group V ovariectomised and fed with normal diet and treated with premarin 100 Âµg/kg. The rats were treated for 60 days. Results: Ovariectomised with curcumin group had significantly higher osteoid and not significant in comparison with ovariectomised control in static power activity. The osteoid of sham operated rats fed with curcumin extract was significantly higher than the ovariectomised control group also. Curcumin was effective as oestrogen in protecting ovariectomy induced bone loss in rats. Supplement of curcumin to Sham rat gave beneficial effect on the bone. Conclusion: The number of osteoid, premature bone forming cells was also increased by giving curcumin. Therefore, curcumin has potential as an antioestroprotic agent in prevention of postmenopausal osteoporosis.

Thomas Bahl
bahltho@aquinas.edu
Aquinas College, Grand Rapids, MI
Co-Presenter: Janine O’Donnell , jeo001@aquinas.edu

**Sex, age, and quantitative motor unit recruitment**

The purpose of this study was to determine if there was a gender difference in the ability of individuals (ages 40 to 55) to quantitatively increase the intensity of grip strength in both their right and left hands. This age group was selected after findings from a previous study conducted at Aquinas College with younger individuals (ages 18-25) found that females were commonly more accurate at quantitatively increasing grip strength. In the current study, there were no significant differences found when comparing men and women who were asked to double or triple their initial grip strengths. Therefore, it was found that sex does not impact quantitative muscle control in fist clenching in 40- to 55-year olds. However, since these findings were not consistent with the previous study, it would seem aging does have some influence on muscle control.

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Understandings as they concurrently

Interprofessional Education (IPE) refers to the opportunity for collaborative learning is known as meaningful interactions with other colleagues from other fields. We found that while students had both positive and negative experiences, overall students from both groups benefited from the experience.

Robert A. Crocker
New York Chiropractic College, Seneca Falls, NY
rcrocker@nycc.edu

The M.S. in Human Anatomy & Physiology Instruction program: a progress report
In January of 2011, the New York Chiropractic College, a fully accredited multi-disciplinary healthcare education institution, introduced a new graduate degree program: Master of Science in Human Anatomy and Physiology Instruction (MSHAPI), offered online to terminal healthcare degree holders and academic biologists teaching, or preparing to teach, anatomy and physiology (A&P) in the undergraduate college and university setting. The MSHAPI program consists of 36 credits, including 18 credits of Human Anatomy & Physiology Instruction, 12 credits of Instructional Theory and Practice, and 6 elective credits. The MSHAPI program leverages the A&P competencies acquired by the candidate in prior educational preparation by combining content expertise with instructional theory and practices. The first cohort graduated in December 2012. This study examines survey data reflecting student demographics, completion rate, and student evaluations of program design, delivery, and effectiveness.

Nicholas Despo
Thiel College, Greenville, PA
ndespo@thiel.edu

HAPS Position statement on animal use
The Animal Use Committee is presenting the society's position statement on animal use. This statement was revised in light of current research in teaching pedagogy and of sensitivities of using animals in experimentation and approved by the Board of Directors last year. The poster will serve to inform attendees of the stance of the Society on the issue of animal use in teaching human anatomy and physiology, to gather reactions and responses to the statement as well as to serve as a site to distribute the Animal Use Committee Emergency Response Plan.

Laken Gibson
West Liberty University, Shadyside, OH
lngibson@westliberty.edu

Co-Presenter: Alicia Hunt, ahunt@westliberty.edu, Matthew Zdilla, mzdilla@westliberty.edu

Circumvallate papillae anatomy, zinc taste perception, and sexual dimorphism
Circumvallate papillae (CvP), organs located on the posterior dorsum of the tongue, house a large proportion of taste buds along their circumference and are particularly important in gustation. A number of factors are known to affect the ability to taste; however, the anatomical characteristics of CvP have not been adequately examined. We performed in vivo endoscopy of 38 college students with an intraoral camera to assess the relationship between CvP anatomy and taste physiology. CvP characteristics were measured with ImageJ software. Mensuration of taste perception was accomplished by administering a 0.1% zinc sulfate solution to participants and then gauging their responses with a zinc taste test (ZTT) and visual analog scale (VAS). There was a significant correlation between CvP circumference and VAS scores (n=31, rs=-0.37, p=0.04). The circumference of male (n=11) CvP was found to be 24.70 Â± 3.96 mm (Mean Â± SEM), whereas female (n=19) CvP circumference was 36.45 Â± 2.91 mm. There was a statistically significant difference (Continued on next page)
between CvP circumference among sexes ($t(28)=2.41, p=0.02$). Although our preliminary data is limited by a small sample size, we have found CvP anatomy to correlate with zinc taste perception. We have also found CvP to be a potential sexually dimorphic trait.

Alicia Hunt
West Liberty University, Wheeling, WV
ahunt@westliberty.edu
Co-Presenters: Laken Gibson, lngibson@westliberty.edu, Matthew Zdilla, mzdilla@westliberty.edu

**Differences between circumvallate papillae circumferences in different areas of the tongue**
Circumvallate papillae (CvP) are important in gustation; however, little is known about variations in CvP anatomy in different locations on the tongue. We performed intraoral photography in a sample of 38 college students to assess the relationship between CvP anatomy and taste physiology. The intraoral photographs of seven individuals were excluded because of poor photographic quality. The circumference of the right anterolateral CvP (RCvP), the circumference of the left anterolateral CvP (LCvP), and the average circumference of the remaining intermediate CvP (ICvP) were calculated. The analysis of variance revealed a significant difference among the CvP groupings ($F(2, 90)=8.64, p=0.0004$). Paired $t$-tests were performed among pairs of groups. There was a significant difference between the RCvP and ICvP groupings ($t(30)=4.97$).

Ellen Ireland
Indiana University, Bloomington, IN
eireland@indiana.edu

**Evaluation of possible agents creating positive selection for the ALDH2*2Lys mutation in Asia**
Many individuals across eastern Asia have a condition known as alcohol intolerance. This condition is caused by a point mutation in the aldehyde dehydrogenase 2 (ALDH2) gene, resulting in the greatly reduced ability to break down acetaldehyde produced during ethanol metabolism. Consuming ethanol results in great discomfort for homozygous individuals and an increase in deleterious alcohol related symptoms in heterozygotes. It is possible that the increased concentration of toxic acetaldehyde in the liver and blood may have a beneficial protective effect against pathogens that lack ALDH2 enzymes. It has also been proposed that poor ethanol metabolism may up regulate production of cytochrome P450, increasing resistance to environmental toxins, or that the benefit may come from conservation of other chemicals (such as vitamin A or serotonin) that ALDH2 can also metabolize. In order to get an idea of what kinds of environmental challenges were present when the mutation arose and spread, archeological information was used to assess where the first population to carry it resided. This information is then compared to other sources of spatial data about the modern patterns of infectious disease. Malaria is a strong candidate for the active selective agent.

Ashraf Karkora
University, Alexandria, Egypt
karkoraash@alexu.edu.eg

**Clinical anatomical studies on the thorax of the dog**
The purposes of the present study were how to use the normal anatomical pattern to be applied on the live dog thorax to establish the most clinical basics of the normal X-ray, ultrasonography and CT images of the thorax referring to their normal cross-sectional anatomy. Fifteen stray dogs of different ages and weights from both sexes were used for the dissection of the thorax after being bled were injected by the ordinary routine method of formalin preservation. A healthy under one year old dog was sacrificed with chloroform solution, the cadaver was placed in freezer in ventral recumbancy, the same position used for the scans, until solid, then after frozen the cadaver was placed on the table with bandwidth and serial transverse sections were cutted approximately 3 cm apart and were photographed immediately with the caudal surface toward the camera. The healthy dog was used for the C.T. scans after physical examination and the dog were anaesthetized then supported in sternal recumbency. The whole body C.T. scan was made with a lice thickness of 1.5 cm apart intervals on the chest and 1 cm apart intervals on the heart. Echocardiography images were obtained from the recumbent side, the best reliable satisfactory images was obtained from the right lateral recumbency. The computed tomography of the thorax consisted of eleven-photo C.T. images, arranged in four figures; frontal; cranial; middle and caudal mediastinal scanogram of dog in a sternal recumbency.

Brian Kuyatt
Hillsborough Community College—SouthShore, Ruskin, FL
bkuyatt@hcclfl.edu
Co-Presenter: Jason Baker, jbaker@regent.edu Regent University, Virginia Beach

**McGraw-Hill LearnSmart Labs beta software for blood: student perceived learning benefits**
Anatomy and physiology (A&P) courses are a stable in science education. Students historically engage in hands-on activities such as dissection and physiology experiments. In recent years, publishers have developed virtual laboratory software to supplement or replace traditional A&P lab activities. The resulting question is whether such virtual lab software products are educationally effective. This pilot study examined learning effectiveness resulting from the McGraw-Hill LabSmart Beta software for Blood. Specifically, 40 students from three A&P courses used the LabSmart software and completed a valid and reliable quantitative instrument called the CAP (cognitive, affective, psychomotor) Perceived Learning Scale and an associated attitudinal survey. Students reported that the LabSmart software significantly increased their cognitive learning over a similar course without the software but reported no such differences in affective or psychomotor learning. The study also found that males using the software reported significantly higher cognitive and psychomotor learning than females but that the

(Continued on next page)
overall learning (Total CAP) difference wasn’t significant. Learning occurred at higher levels when instructors trained the students in LabSmart use; however, merely using the software tutorials didn’t achieve the same results. These results imply that the McGraw-Hill LabSmart software can be an effective tool to help students learn cognitively about hematocrit, blood type, and hemoglobin analysis but doesn’t necessarily result in corresponding affective or psychomotor gains. Additionally, the effectiveness of the software is dependent in part on the instructor’s engagement with the software. Further studies should be conducted to determine which facets of the software have the greatest learning effects.

Thomas Lehman
Coconino Community College, Flagstaff, AZ
tom.lehman@coconino.edu

**Current Events in the HAPS Committees**

Would you like to learn more about what’s going on in HAPS? Would you like to pursue your interests within one of our committees? There are sixteen (16) committees in HAPS, each focused on specific projects or directives within the Society. Many of the committees offer opportunities for you to become involved in projects that you may find very rewarding and enriching. This poster offers a few examples of current and upcoming projects for our various committees. Keep an eye out for our committee Chairs (look for the bulls-eye buttons); you can get some great one-on-one time with them and learn how you can help us and help yourself. Even more, you can read about the committees in the conference program and online. The HAPS Committees are a great place to learn more about the Society, develop your own skills as a professional, and help others grow as instructors. Join us now.

Vuvi Nguyen
University of North Texas Health Science Center, Fort Worth, TX
vn0048@live.unthsc.edu
Co-Presenters: Armando Rosales, armando.rosales@unthsc.edu, Rustin Reeves, rustin.reeves@unthsc.edu

**Extensor Indicis Brevis: A Rare Anatomical Variant of the Upper Limb**

During a routine cadaveric dissection, a rare anatomical variant was found on a 74 year-old male cadaver. This variant is described as a extensor indicis brevis muscle and was located on the dorsum of the hand of the left upper limb. The extensor indicis muscle normally originates from the posterior surface of the distal third of the ulna and the interosseous membrane of the forearm. However, this variant had no muscle body present in the forearm. Instead, the muscle was found exclusively on the dorsum of the left hand. It had an origin from the posterior surface of the scaphoid bone. This anomaly was found unilaterally. The extensor indicis muscle on the right forearm of this cadaver had a normal origin from the ulna and interosseous membrane. Both the extensor indicis brevis on the dorsum of the left hand and the extensor indicis muscle of the right forearm had normal insertions into the extensor expansion of the 2nd digit. The earliest known case report of this anatomical anomaly was found in a 19- year-old male patient in 1961 (Bingold). Other reports have indicated the extensor indicis brevis is often found bilaterally. Diagnosis of patients with this rare variant has occurred from complaints of pain and swelling in the dorsum of the hand, often leading to its discovery during surgery. From the initial description of the extensor indicis brevis, reports indicate the rarity of this anatomical variant to be found in approximately 0.6% to 2.6% of specimens.

John Pattillo
Middle Georgia State College, Macon, GA
john.pattillo@maconstate.edu

**The LEDAxon: An open-source, interactive model for demonstrating action potential conduction**

The generation and conduction of action potentials involves rapid changes in multiple physiological parameters across both time and membrane space. Thus the physiology of axons is often difficult for students to visualize accurately. This presentation describes the development of a dramatic physical model of the axon suitable for both in-class demonstrations and individual student use. The model uses a 5-meter strip of red-green-blue light emitting diodes (RGB LEDs) to represent an axon. Various physiological parameters can be represented by changes in the intensity and/or color of LEDs. For example, the propagation of voltage changes during action potential conduction can be seen as a wave of light traveling down the length of the strip, changing in both color and intensity. The LED strip is controlled by an inexpensive, single-board computer (raspberrypi.org) running Neuron simulation software (neuron.yale.edu). Thus, the visualization provided by the strip is the result of a research-grade numerical simulation. The effects of changing conditions such as axon diameter, temperature, myelin sheath, and various pathologies can easily be demonstrated by changing simulation parameters. The model is portable, easy to use, and can be built using entirely off-the-shelf parts. The design, construction, and use of the model and accompanying software are described.

John Schuijers
La Trobe University, Bundoora, Victoria, Australia
J.Schuijers@latrobe.edu.au
Co-Presenters: Stuart McDonald, Stuart.McDonald@latrobe.edu.au, Tom Samiric

**The development of a new physiology and anatomy stream within an existing Bachelor of Health Sciences course**

Whereas physiology and anatomy are commonly taken as core subjects within many medical, allied health and science courses, University degrees which concentrate on both anatomy and physiology as the major and minor areas taken throughout all three years of the course are uncommon. Here we describe the development and construct of the physiology and anatomy stream within a three year Bachelor of Health Sciences course. Physiology and anatomy subjects form
Poster Session 3 -
Grand Ballroom F-G-H
Monday, May 27:
3:00- 4:00 PM

Marianne Baricevic
Raritan Valley Community College,
Branchburg, NJ
mbaricev@raritanval.edu

A summer bootcamp workshop improves student grades and retention in Anatomy & Physiology
Anatomy & Physiology students often become extremely overwhelmed early in the semester due to the volume and intensity of the course content, as well as the general college experience. A voluntary summer bootcamp workshop was offered to all incoming Anatomy & Physiology I students in the summer before the start of the fall 2012 semester. The workshop was designed to introduce basic introductory concepts of Anatomy & Physiology so that the beginning of Anatomy & Physiology I was not as intimidating. The workshop consisted of 5 individual sessions, each running 2-4 hours during the week of August 20-24, 2012. Students were encouraged to attend all sessions. For students who were unable to attend the on-campus workshop, but were interested in participating, a parallel online workshop on the college LMS was also available throughout the month of August, 2012. Approximately 140 of the 320 enrolled Anatomy & Physiology I students registered to participate in the workshop. The workshop was very well-received and student surveys, exam grades and final semester grades indicate that it was effective in increasing student success and retention in Anatomy & Physiology I.

Jacqueline Carnegie
University of Ottawa, Ottawa, Canada
jcarnegi@uottawa.ca
Co-Presenter: David Cook.
dcook082@uottawa.ca

Student-identified challenges in A & P: tackling the tough stuff
Undergraduate anatomy and physiology (A&P) curricula are largely instructor-driven in terms of the in-class time and teaching strategies devoted to each topic. Despite a wealth of online tools, learning challenges do still exist for some students tackling A&P for the first time. Contributing factors may include large class sizes and/or inadequate prior education. While instructors can frequently identify complex topics and adjust their teaching accordingly, their familiarity with the subject matter may interfere with recognition of gaps in student understanding. This project was designed to identify A&P topics most commonly found troublesome by students with the goals of modifying in-class instruction and providing guidance for self-directed learning to address those deficits. Students (n=168) enrolled in the first term of A&P completed an optional assignment in which they identified a topic that continued to be challenging following its presentation during lecture, summarized steps taken to try to improve understanding, and suggested in-class strategies to promote comprehension. Topics most frequently identified included multi-step processes such as resting membrane potential, action potential generation, the sliding filament mechanism of muscle contraction, and the cardiac cycle. On a positive note, 76% of students followed up with textbook reading and 51% accessed online learning resources provided by the instructor and/or textbook publisher. However, 24% did not report reading the textbook and 34% searched online resources via Google and YouTube rather than using their own course-specific learning tools. Despite extensive in-class use of animations and videos, 53% of students requested more of these visual tools during lectures.

Keely Cassidy
Indiana University, Bloomington, IN
kmcassid@iu.edu

Embryology in the medical curriculum: student study approaches, attitudes, and beliefs
Medical students are inundated with vast amounts of knowledge, but the neglect of traditional subjects such as human embryology is becoming more prevalent. This may be attributed to pressure placed on schools to fit an increasing wealth of information into decreasing contact hours. It is rare to find an emphasis placed upon embryology, and even more uncommon to encounter an associated laboratory. As a result many first year medical students view embryology as an afterthought and intend memorization to be sufficient for exams. Although they agree that a foundation of embryology assists in understanding gross anatomy, students find it difficult to comprehend and are often discouraged by its piecemeal dispersion into various anatomy and physiology courses. With more drastic changes on the horizon for medical curriculum, embryology will be forced to either validate its place within this crowded arena or fade away. To investigate these issues, a mixed methods survey was implemented before and after the head and neck embryology component of a gross anatomy course to examine student study approaches, attitudes, and beliefs. Students elucidated their previous experiences with embryology, studying resources and group composition, aspects of embryology they find most interesting and most frustrating or confusing, and their level of agreement with statements regarding embryology in anatomy and physiology education and its relevance in modern medicine. By investigating student study approaches, attitudes, and beliefs toward embryology, instructors and medical curriculum advisory committees will be better equipped to position this subject appropriately and effectively within anatomy and physiology education.

(Continued on next page)
Assessment of Testing Methods in Human Anatomy Laboratory

Background: Human Anatomy Professors rely on slides, drawings, illustrations, models, and dissected specimens as teaching tools in the laboratory. In recent years there has been expanded use of substitutions or integration of the above with computer simulations, micrographs, illustrations, diagrams to facilitate the teaching process. These different materials and specimens appear to fall under two categories: 1) Hands on materials: Three dimensional models, microscope slides and dissected specimen 2) Interpretive graphics: Computer graphics, illustrations and micrographs. The question is what method is most appropriate and effective in teaching and testing students in the laboratory? Purpose: The purpose of this study is to compare the effectiveness of the two different techniques used on laboratory exams to test a student’s understanding of Human Anatomy. Design: Seventy two Human Anatomy students participated in this study. Students were blinded to the experiment. Four laboratory exams were given with a total of 178 questions. Half (89) of the questions at stations were hands on material and half (89) interpretive graphics. Results: Although students did perform better on the subcategories of hands-on histologic slides and dissected specimens, overall there was no significant difference in the percent of questions answered correctly by students for the two methodologies (P > .05). Also students did not have a preference of one method of testing over another. Conclusion: Results of our prospective study suggest that carefully selected interpretive graphics appear to be an appropriate teaching and testing tool in the Human Anatomy laboratory.

Michel Désilets
University of Ottawa, Ottawa, ON, Canada

Involving medical students in teaching anatomy to health sciences students: a mutual benefit

The project consisted of having second year medical students participate as anatomy lab demonstrators for undergraduate students enrolled in large-size classes of anatomy and physiology. The main objectives were: 1) to give students in health sciences, including nursing, the opportunity to complement their theoretical formation with human anatomy labs, 2) to allow medical students to consolidate their knowledge of anatomy, 3) to encourage inter-professionalism among medical and other health-related students. Optional anatomy labs were taken by some 220 Health Sciences students. Groups were divided into 8-10 students and each group was assigned to a medical student. Duration of the labs: 90 minutes. Systems studied: mainly musculoskeletal anatomy, with an overview of neuroanatomy. Surveys from Health Sciences students showed that the vast majority of them (97%) considered that the activity enhanced their learning of anatomy. Furthermore, 93% of them appreciated the demonstration by their assigned medical student, and 87% considered that this interaction has allowed a better understanding of medical studies in general. Responses of the participating medical students showed a similar consensus: all of them have appreciated their experience and considered that it consolidated their own knowledge of anatomy. Further, they all confirmed that the activity triggered discussions on medical studies. In conclusion, the project has demonstrated the feasibility, relevance and very strong student support of the integration within health sciences courses of optional anatomy labs presented by medical students. This project was supported by the Consortium National de Formation en Santé (CNFS) of Canada.

Mukul Ganguli
South Texas College, McAllen, TX
mganguli@southtexascollege.edu

The role of class attendance on student performance in an Anatomy & Physiology I course

At South Texas College, the two sequences of the Anatomy & Physiology course meet twice per week for 2 hours and 50 minutes per session. Given the long class hours and 16-week long semester, attendance is a big concern for students. As an incentive to attend class, I allocated 50 points (5%) of the total grade to class attendance. I deduct 2 points if a student is 15 minutes late, 3 if 30 minutes late, 4 if half the class missed and 5 if absent. The purpose of this investigation is to understand the relationship between attendance and student performance. A total of 201 students over a period of four semesters were studied. There was a significant correlation between attendance and the final course grade with r = 0.56 (p<.01). At 8 weeks, the attendance scores for students with grades A through F were 47.1, 45.4, 40.6, 40.2 and 39.1 respectively. There was no significant difference between students with grades A and B and between students with grades C and D. However, there was a significant difference between students with grades B and C (p<.01). At 16 weeks, the attendance scores for students with grades A through F were 41.7, 37.8, 28.0, 24.9 and 21.2 respectively and the difference is significant (p<.01). The results show not only that class attendance has a significant effect on students’ performance, but also that there is a significant drop in attendance as the semester progresses for all students.

Detlev Grabs
Université du Québec à Trois-Rivières
grabs@uqtr.ca

Co-Presenter: Ursula Grabs  ursula.grabs@uqtr.ca

Improving medical skills using Thiel embalmed cadavers?

Since 2004 the Laboratory of Anatomy of the Université du Québec à Trois-Rivières accommodates the medical students of the University of Montreal,
for their hands-on experience in anatomy. Preclinical year students have access to the anatomy laboratory and specifically prosected specimen during the system related problem based learning courses. During the postgraduate curriculum, we have introduced the use of Thiel embalmed cadavers that give the advantage of preserved color and texture as well as flexibility of joints over a long period of time without the risk of infections. These specimen are used for teaching surgical approaches and techniques at various time during surgical residencies, and for continuous medical education workshops. Since the introduction, these cadavers have been appreciated by a variety of medical professionals and demands for access to these cadavers have grown exponentially. We present here several applications that are regularly taught in our laboratory as well as examples of clinical research projects done in our gross anatomy laboratory to show the advantages and the possibilities given by this embalming technique, particularly in relation to the formation of: a) plastic surgeons (flap transplants with vascular visualization, reconstruction), b) surgeons/ orthopedics (endoscopy, laparoscopy), c) critical care teams (thoracic drainage, lumbar puncture, intubation, abdominal liquid scan - FAST), d) anesthesiologists (ultrasound guided regional anesthesia, development of nerve block techniques) and e) physiatrists (articular and bursa infiltration).

Lotte Illeris  
University College Capital UCC, Hilleroed Capital Region, Denmark  
l3@ucc.dk  
Co-Presenters: Robin Leutert rl3@ucc.dk , Karin Seyfarth ks3@ucc.dk

Danish nurse students finds human anatomy and physiology important for work in the nurse profession, but need to know the practical use of it during their educational years  
Nurse education in Denmark undertook great reforms in 2008 focusing on academizing education and hence enforcing the theoretical frame of nurses who are now entitled professional bachelors of nursing. Despite great effort among professors in human anatomy and physiology, students find courses in these subjects extremely difficult. In order to optimize teaching in these courses we carried out a questionnaire among first, second and third year students to obtain more detailed information about background of students compared to obtained notes in tests, and opinions about the subject. It turned out, that demographic factors of students such as age, number of kids, years since entrance examination was undertaken, whether students were in a relationship or not, were not important for their acquisition of the science subjects. Therefore these factors were unimportant for obtained notes in tests containing anatomy and physiology. On the other hand former education in the health field made the perspective of anatomy and physiology clearer for nurse students and hence, especially tests containing practical cases from clinical periods meant higher notes for these students. Also students without practical experience or former education in the health field tended to obtain high notes if they during high school took level A classes of Biology, whereas high school levels of Math, Physics, and Chemistry had no influence of marks. All in all students tended to obtain highest notes in theoretical exams if they contained evaluation of practical situations in nursing. In general, students found anatomy and physiology very important for practical work in the nurse field, however, they also found it very difficult to acquire during education. We are now analyzing student interviews to get viewpoints deepened, and we plan to include clinical nurse trials in the teaching to get practical perspective on the subjects.

Jenny McFarland  
Edmonds Community College, Lynnwood ,WA  
jmcfarla@email.edcc.edu  
Co-Presenter: Whitney Schlegel  
wreilly@indiana.edu , Indiana University, Bloomington, IN

PULSE Partnerships for Change: Moving from “Vision” to “Change” in Undergraduate Life Science Education  
What will it take to bring about the necessary transformation of STEM higher education described in Vision and Change? PULSE (Partnership for Undergraduate Life Sciences Education) is a joint effort by National Science Foundation (NSF), National Institutes of Health (NIH) and Howard Hughes Medical Institute (HHMI) to stimulate systemic changes within biology departments at all types of post-secondary educational institutions, based upon

(Continued on next page)
the 2011 report Vision and Change in Undergraduate Biology Education and other calls for transformation of life sciences education. We have the change mandate (the problem). We have the change evidence (the solutions). We now must implement and institutionalize, specifically at the departmental level, teaching practices that provide for the 21st century Vision and Change learning outcomes. The PULSE Leadership Fellows are tasked with facilitating pathways to foster change in undergraduate life science education. This poster will share the PULSE action agenda and our work to date, facilitate communication with the broader biology undergraduate education community, including HAPS, in the PULSE community as we foster change. Supported by NSF, HHMI and NIH.

Debra A Rajaniemi  
Goodwin College, East Hartford, CT  
drajaniemi@goodwin.edu  
Co-Presenter: Vicky L Navaroli , vnavaroli@goodwin.edu

The Development of two Anatomy and Physiology courses that allows students to complete their course requirements at home using eScience Labs  
A two semester online Anatomy and Physiology 1 & 2 course was developed with complete online instructions. The lab portion is distributed a “Lab in a Box” provided by eScience. Students using eScience lab kits have the flexibility of online learning while completing comprehensive hands-on experiments at home. These experiments include dissections, blood typing, blood pressure, lung mechanics, bone and muscle identification, protein and enzyme analysis, histology, reflex testing, etc. eScience provides students with full-color lab manuals, customized kits, safety equipment, video instructions, animations and integration into an LMS. This course accommodates all learning styles giving the freedom students need to work at their own pace. Students are accessed by completing weekly material including discussions, comprehensive lab manual work, lecture and lab quizzes, lab reports, practicals, and lecture exams. The lab reports include pre- and post-lab questions as well as submission of pictures and videos of their experiments. The online lecture exams, lab practicals and course work are generated through McGraw Hill’s software. All graded content are timed and extended times provided for students who need accommodations. Student responses are positive and overwhelming. Students love the ability to work at their own pace, spend less time on travel, more quality time with their families and less out-of-pocket expenses. Students with test anxiety feel comfort and relaxed working in the privacy of their home. Pregnant students, full-time parents and students recovering from surgeries/illnesses can finish their coursework without taking a medical leave thus completing their course requirement.

Andrew Notebaert  
Indiana University, Bloomington, IN  
anotebae@indiana.edu

Analysis of strategies used by students taking a multiple-choice exam for undergraduate human anatomy  
The study of anatomy lends itself well to visual study aids for examination preparation but there is little research examining the student construction of visual aids (sketching) as an anatomy test taking strategy. A retrospective analysis was performed on one set of multiple-choice exams completed by students enrolled in an undergraduate human anatomy course. Analysis was completed on the top quarter and bottom quarter of exams based on the student’s score for that exam. Each group consisted of 94 students. The exam papers were analyzed to see how the students marked on their exam sheets, such as eliminating answers, writing down notes, or making quick sketches to aid them in answering the questions. The researcher created the following categories of exam strategies: few or no marks on the paper, elimination of answers, indication of answer choice, indication of difficult questions, sketching, writing notes and highlighting in the question stem. Total counts were taken for each category. Elimination of answers was the most common strategy used by both groups of students. Most of the top performing students but less than half of the low performing students indicated their answer choices on the exam paper. Top performing students were also more likely to write down notes on the exam paper and to highlight key words in the question stem. Low performing students were more likely to not make any marks at all. The initial analysis seems to indicate that very few students utilized any type of sketching (5 total students, 4 from the low performing group) and relied on common test taking strategies such as eliminating answer choices. Further research should be done to examine the effects of sketching on an anatomy exam as a test taking strategy and to determine if it is beneficial on a multiple-choice anatomy exam.

Laurel Roberts  
University of Pittsburgh, Pittsburgh, PA  
laurelb@pitt.edu  
Co-Presenter: Ted Gobillot  
tag41@pitt.edu

Each one, teach one: developing and publishing teaching resources  
Maintaining professional development can be a daunting task with a full teaching load. Publishing, particularly without a funded research program, is difficult. Two online archives offer opportunities for peer-reviewed publishing of teaching resources. The BEN portal is an easy way to access digital education materials from multiple medical, biological and chemical online resources. The BEN Scholars Program trains and encourages faculty in the use of BEN and its dissemination to the wider teaching community and is sponsored by AAAS, The American Physiological Society and American Society for Microbiology. The iCollaborative (sponsored by the Association of American Medical Colleges) promotes the development of teaching resources based on the guidelines for the revised MCAT exam (MCAT2015). An example of the resources available on BEN is “Exploring Scientific Literature” a project developed by an undergraduate teaching assistant. The project was designed to make

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introductory students critical readers of primary scientific literature. While their performance on exam questions directly related to the article was low (66% v. 68% Exam 2 mean), we found that students were able to retain their ability to critically analyze graphical data throughout the rest of the course (81.8% v. 68% Exam 4 mean). The poster describes the project, which has been published by the HAPS Archive (a BEN collaborator), outlines the submission process for BEN and the iCollaborative, and presents ideas for collaborating with undergraduate teaching assistants.

Amanda Rosenzweig
Delgado Community College, New Orleans, LA
arozen@dcc.edu

Comparing biology grades based on instructional delivery and instructor at a community college: face-to-face course versus online course

Through distance learning, the community college system has been able to serve more students by providing educational opportunities to students who would otherwise be unable to attend college. The need and purpose of the study addresses if there is a difference in students’ grades between face-to-face and online biology related courses and if there are differences in grades between face-to-face and online biology courses taught by different instructors and the same instructor. The study also addresses if online course delivery is a viable method to educate students in biology-related fields. The study spanned 14 semesters between spring 2006 and summer 2011. Data were collected for 6,619 students. For each student, demographic information, cumulative grade point average, ACT, and data on course performance were gathered. Student data were gathered from General Biology I, Microbiology of Human Pathogens, Human Anatomy and Physiology I, and Human Anatomy and Physiology II courses. Univariate analysis of variance, linear regression, and descriptive analysis were used to analyze the data and determine which variables significantly impacted grade achievement for face-to-face and online students in biology classes. The findings from the study showed that course type, face-to-face or online, was significant for Microbiology of Human Pathogens and Human Anatomy and Physiology I, both upper level courses. Teachers were significant for General Biology I, a lower level course, Human Anatomy and Physiology I, and Human Anatomy and Physiology II. However, in every class, there were teachers who had significant differences within their courses between their face-to-face and online courses. This study will allow information to be concluded about the relationship between the students’ final grades and class type, face-to-face or online, and instructor. Administrators, faculty and students can use this information to understand what needs to be done to successfully teach and enroll in biology courses, face-to-face or online.

Kathy Starr
Western Carolina University, Cullowhee, NC
kstarr@email.wcu.edu

Assessing background knowledge for a physical therapy human anatomy course

Prior to entering the Doctor of Physical Therapy (DPT) program at Western Carolina University students are required to complete 6-8 semester hours of human anatomy and physiology either as individual courses or as a combined A&P course sequence. A Background Knowledge Probe was administered to incoming students to assess whether they had the foundational knowledge of anatomy necessary for successful completion of the physical therapy department human anatomy course (PT 821). The Probe, composed of 62 questions prepared by the instructor, was administered to students at the beginning of fall semester 2012. The mean score on the Probe was 69% (SD = 9.016, n=32). Data were collected from admissions applications to determine variables that might influence a student’s background knowledge. There was no significant difference in performance on the Probe based on where the last prerequisite A&P course was completed (college/university vs. community college). A Pearson correlation coefficient calculated for the relationship between the amount of elapsed time since completing the last A&P prerequisite course and performance on the Probe revealed a significant negative correlation (r(31) = -.398 p<.05). Students tended to perform more poorly on the Probe with greater time span since completing the last A&P prerequisite course. When asked how they perceived their anatomy background before entering the DPT program a majority of students (66%) felt their background was adequate but with some areas of weakness. Of the remaining students, 28% felt their background might not be adequate and 6% felt confident that they were fully prepared for the anatomy curriculum. Overall, students identified the nervous system (44%), integumentary system (28%), cell biology (28%) and lymphatic system (22%) as areas of potential weakness.

Janice Toyoshima
Evergreen Valley College, San Jose, CA
janice.toyoshima@evc.edu

Co-Presenter: Abdie Tabrizi, abdie.tabrizi@evc.edu

Bone compression experiments as a tool for introducing students to biomechanics

Advances in medicine, science, and technology have helped increase the average life expectancy of humans by three decades over the past century. A field of biomechanics has helped engineers and scientists to design prosthesis devices to enhance human life. Research in biomechanics has allowed us to understand limitations of the human body and has had profound impact in design of vehicles for passenger protection, sports medicine, and space travel. Human bones are constantly subject to external forces while walking, running, jumping, or falling. It is imperative to understand the types of forces that human bones are subjected to and to know their ultimate strength. To introduce undergraduate college students to the subject of biomechanics an experimental technique has been designed to determine compressive breaking (Continued on next page)
load of the human femur. The cortical section of the femur shaft is subjected to compression load until it fails. The failure mode and strength are then determined. Students are then given information to help them design a replacement part. This poster details the entire process and some results.

THREE UPCOMING COURSES:
Beginning in September - enrolling now.
a) Advanced Cardiovascular Physiology: The Heart and Vascular System
b) Current Topics in Anatomy & Physiology
c) Teaching Respiratory Physiology I - Functional Anatomy and Ventilation

FIVE ADDITIONAL COURSES:
will be offered in Spring 2014 - watch hapsweb.org and the HAPS Facebook page for updates.
HAPS COMMITTEES AND BOARDS

ANIMAL USE
Nicholas Despo, Chair
Thiel College
Greenville, PA
724-789-2067
ndespo@thiel.edu
Distributing the HAPS policy statement, developing guidance on animal use Internet links onhapsweb.org, monitoring relevant legislation, and creating a resource packet for HAPS members.

CONFERENCE COMMITTEE
J. Ellen Lathrop-Davis, Chair
Community College of Baltimore County-Catonsville
Catonsville, MD
410-455-6947
elathrop@ccbc.edu
Recruits nominees for HAPS elected offices.

CADAVER USE
Christine Eckel, Co-Chair
West Virginia School of Osteopathic Medicine
400 North Lee Street
Lewisburg, WV 24901
704-647-6226
cneckel@osteo.wvsom.edu
Melissa Carroll, Co-Chair
UTEP (University of Texas at El Paso)
7071 Villa Hermosa Dr.
El Paso, TX 79912
(915)747-7260
mcarrol@hapsconnect.org
Develops guidelines for the use of cadavers in anatomy instruction.

COMMUNICATION
Pat Browne, Chair
Biology Department
Alverno College
3401 S. 39th St.
Milwaukee, WI 53234
pat.browne@alverno.edu
Recruits new members, provides service to members, and willingly provides information on the activities of their committees.

CURRICULUM AND INSTRUCTION
Hiranya Roychowdhury, Co-Chair
NMSU-Dona Ana Community College
575 527 7725 (office)
512-627-7517
broychow@nmsu.edu
Curtis DeFriez, Co-Chair
Weber State University
801-626-6382 fax
801-940-6844
cdefriez@weber.edu
Curriculum and proofreading final draft of the HAPS Educator.

EXECUTIVE
Valerie O’Loughlin, President and Chair
Indiana University, Bloomington
Jordan Hall 104
Bloomington, IN 47405
812-3220024
vdleean@indiana.edu
Composed of the HAPS President, President-Elect, Past President, and Treasurer.

EXECUTIVE DIRECTOR
Peter English
peter@hapsconnect.org

FOUNDATION OVERSIGHT
Bob Groer, Co-Chair
New York Chiropractic College
70 Division Ave.
Levittown, NY 11756
516-796-4800, ext. 136
rgroer@nycc.edu
Don Kelly, Co-Chair
Mohawk Valley Community College
1101 Sherman Drive
Utica, NY 13501
315-792-5363
dkelly@mvycc.edu
Organizes fundraising activities, ensures that fund monies are securely invested, and administers the grant and scholarship programs funded by the HAPS Foundation.

HAPS EDUCATOR
Sarah Cooper, Co-Editor
Arcadia University
450 South Easton Road
Glenside, PA 19038
215-577-2179
coopers@arcadia.edu
Jennelle Malcos, Co-Editor
Penn State University
208 Mueller Lab
University Park, PA 16802
607-423-3178
ilhelyer@yahoo.com
Provides advisory and support services to the HAPS-EDucator Editor, i.e. soliciting and reviewing articles, and proofreading final draft of the HAPS Educator.

HAPS INSTITUTE
Peter English, Chair
512-627-7517
peter@hapsconnect.org
HAPS-Institute@hapsweb.org
HAPS does not have a formal Institute; however, HAPS has affiliated programs with a number of universities.

MARKETING
Elizabeth Hodgson
York College of Pennsylvania
441 Country Club Rd.
York, PA 17404
717-815-1530
ehodgson@ycp.edu, marketing@hapsweb.org
Promotes HAPS in all ways and is the liaison between HAPS and A&P vendors.

MEMBERSHIP
Elizabeth Pennefather-O’Brien, Chair
Macon State College
Macon, GA
478-471-2752
cdefriez@weber.edu
Eric Sun, Co-Chair
Weber State University
801-626-6382 fax
801-940-6844
cdefriez@weber.edu
Curriculum and proofreading final draft of the HAPS Educator.

NOMINATING
Tom Lehman, Chair
Coconino Community College
Flagstaff, AZ
928-226-4282
tom.lehman@coconino.edu
Recruits nominees for HAPS elected offices.

PRESIDENTS EMERITI ADVISORY BOARD
Don Kelly
Mohawk Valley Community College
1101 Sherman Drive
Utica, NY 13501
315-792-5363
dkelly@mvycc.edu
An experienced advisory group including all Past Presidents of HAPS. Advises and adds a sense of HAPS history to the deliberations of the BOD.

SAFETY
Joseph Okubadewo, Chair
jolubadewo@asu.edu
Develops standards for safety in the laboratory.

STEERING
Ron Gerrits, Co-Chair
Milwaukee School of Engineering
Milwaukee, WI
414-277-7561
gerrits@msew.org
Christine Eckel a Co-Chair
West Virginia School of Osteopathic Medicine
400 North Lee Street
Lewisburg, WV 24901
304-647-8224
cneckel@osteo.wvsom.edu
Consists of all committee chairs, coordinates activities between committees, and represents collective committee activity to the HAPS BOD.

TESTING
Curtis DeFriez, Co-Chair
Weber State University
Ogden, UT
801-940-6844
801-626-6382 fax
cdefriez@weber.edu
Eric Sun, Co-Chair
Macon State College
Macon, GA
478-471-2752
cdefriez@weber.edu
Completed, tested, and approved the HAPS Comprehensive Exam for Human A&P. Developed on-line version.

2014 CONFERENCE COORDINATOR
Lourdes Norman-McKay, Ph.D.
Florida State College Jacksonville
Office A101M Cecil Center North
5640 New World Avenue
Jacksonville, FL 32221
(904) 779-4054
The Committee Chairs invite input from HAPS members and willingly provide information on the activities of their committees.