AP 6232 Locomotion Neuromechanics — Spring 2013

Meeting Time: Wednesday, 9:00-12:00pm, Applied Physiology Bldg., Room 1103
Online Discussions: Wednesday-Tuesday following each week's class period

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Course Discussion Listserve Address: apph6232a@lists.gatech.edu

Find more course listserve info at: https://lists.gatech.edu/sympa/info/apph6232a , or, http://www.ap.gatech.edu/Chang/Lab/CNL/APPH6232.html

Course Objectives: This course is intended for graduate students as a directed study of locomotion neuromechanics principles through reading of the primary literature, presentation of ideas, and through scholarly discussion with classmates and experts in the field.

Week	Class Discussion Topic	Student Discussant (Guest Expert)	Student Summary Updates
1 Jan 9	**ORGANIZATIONAL**	**N/A**	
2 Jan 16	**Student Topic Updates**	*Jessica, Hongchul, Tingnan (video)*	
3 Jan 23	**Student Topic Updates**	*Erin, Lauren, Patricia (video)*	
4 Jan 30	*Receptor mechanisms for heterogenic reflex pathways*	Student Host: *Lauren* (Expert—Richard Nichols, Georgia Tech)	*Jessica, Hongchul*
5 Feb 6	*Flying squid*	Student Host: *Patricia* (Expert—Ronald O'Dor, Dalhousie Univ.)	*Lauren, Erin*
6 Feb 13	*Differential function of cat soleus and m. gastroc.*	Student Host: *Hongchul* (Expert—W Herzog, U Calgary;M Kaya, Tohoku U)	*Tingnan, Jessica*
7 Feb 20	*Interlimb reflexes in walking after stroke*	Student Host: *Jessica* (Expert—Paul Zehr, Univ. of Victoria)	*Patricia, Tingnan*
8 Feb 27	*Jumping salmon*	Student Host: *Patricia* (Expert—D.V. Lauritzen, UCLA)	*Hongchul, Erin*
9 Mar 6	*Adaptation to exoskeletons*	Student Host: *Erin* (Expert—Keith Gordon, Northwestern Univ.)	*Lauren, Patricia*
10 Mar 13	*EMG differences in sprint vs. endurance trained athletes*	Student Host: *Lauren* (Expert—Cora Huber, Med. Hoch. Hannover)	*Jessica, Hongchul*
11 Mar 20	**No Classes**	**SPRING BREAK**	**SPRING BREAK**
12 Mar 27	*Scaling of Burrowing in Worms*	Student Host: *Tingnan* (Expert—Kelly Dorgan, UC San Diego)	*Patricia, Erin (video)*
13 Apr 3	*Infant locomotor reflexes*	Student Host: *Jessica* (Expert—Tania Lam, U British Columbia)	*Lauren, Hongchul (video)*
14 Apr 10	*Synergies in human walking*	Student Host: *Hongchul* (Expert—Stacie Chvatal, Ga Tech)	*Jessica, Tingnan (video)*
15 Apr 17	*DRAFT PRESENTATIONS OF WIKIPEDIA ENTRIES*	***Wikipedia draft presentations:*** *All Students*	
16 Apr 24 *Last Class*	*DRAFT PRESENTATIONS OF WIKIPEDIA ENTRIES* Last Week of Class	***Wikipedia draft presentations:*** *All Students*	
17 Day TBD ***Time TBD Exam Week***	**FINAL PRESENTATIONS**	***Final presentations (wiki or ppt):*** *All Students*	

Grading:

Participation: *(in class & online)*	**50%**	**Oral Presentations:**	**25%**
		Wikipedia Entry (due May 1):	**25%**

What will I be asked to do?:

The course is structured so that each student can maximize pursuit of their own individual research interests, but will also be stimulated by feedback from and interests of other students. You will be carrying out your own independent literature review throughout the semester on any topic related to locomotion and periodically report back to the group. You will be asked to lead a discussion of one of your papers one-two times. You will also initiate contact with one of the authors of your chosen paper and host an online discussion with the rest of the class. These will be the specific tasks you will be asked to perform:

- **Find and read on your own** ≥1 paper/week on your topic
- **Present 15 min summary** of one of your papers (~3-4x depend. on enrollment)
- **Lead discussion** (45 min.) of one of your papers & invite an author from your chosen paper to participate in an **online discussion** with the class (1-2x)
- **Read & discuss** a paper to be discussed each week chosen by another student
- **Final Presentation** (25 min.) of your Wikipedia entry in lieu of Final Exam
- **Write a Wikipedia.org** entry on your topic (should include ≥10 papers) citing papers and synthesizing any conclusions.

So what will happen each Wednesday in class?:

In the first hour, we will listen and discuss presentations by 2 students on papers they have found and read for their topic (*15 minutes* each). Students listening will be expected to provide thoughtful questions about the paper and constructive criticism about presentation style (this is a learning experience for all!).

In the second hour, the Student Discussant for the week will lead ~1-hour discussion on their chosen paper and will put together a short list of questions about the paper. This student will have *already* invited one of the authors from that paper to join the class for an online (email) discussion to take place over the following week (Wednesday-Tuesday, see next item below).

The following week, in lieu of a third hour of class time, we will participate in an on-line discussion with one of the authors from the previously discussed paper. The Student Discussant will act as host/moderator and will throw out the first questions from the class to get the ball rolling. The Student Discussant will be responsible for contacting the guest and providing instructions to the guest—YHC will do the actual management of the list and will help the Discussant as needed in identifying virtual guests.

How do I invite someone to participate in the online seminar?:

One of the goals of this course is for you to start feeling more comfortable interacting with other scientists in the field and to learn to think of them as professional colleagues. These scientists are regular people just like you—most of them are very interested in graduate education and are receptive to this type of invitation (and even flattered that a class would like to discuss their published work!). This is also a good way to start networking with people that you may someday see at a meeting, have review your future papers/grants, or want to apply for a postdoctoral position. YHC will work with you in picking topics and appropriate papers to present and likely authors to contact. Here is an example e-mail that YHC sent for a similar type of course when he was a graduate student (many moons ago!):

> Hello Prof. Williams,
>
> On Wednesday, April 14, I will be leading a "virtual" seminar on secondary aquaticism in the mammals. This is part of a graduate seminar co-taught at UC-Berkeley by Marvalee Wake and Rodger Kram on "Evolution and Locomotion Biomechanics". We often read and discuss papers on a particular topic and then correspond with the authors of those papers via e-mail for more discussion. I would like to invite you to participate as an expert in the area of my particular seminar topic.
>
> I wanted to focus on the evolution and physiology of modern analogs thought to be representative of the transitional (semi-aquatic) forms. Your recent paper in the Philos. Trans. of the Royal Society on the evolution of cost of efficient swimming would be ideal for us to discuss. Your idea of the evolutionary/metabolic obstacle of an obligatory semi-aquatic lifestyle is intriguing and should result in some great discussion.
>
> We only ask that you be available online over the week of April 14-21 to correspond via e-mail with us. You may respond to our questions as frequently (daily) or as infrequently (once or twice) as you like. In the past, our "virtual seminar participants" have really enjoyed the stimulating exchange. Charlie Ellington, Steve Gatesy, John Long, and Andy Biewener are some examples of past guests. I hope you will consider this opportunity to speak with us. Thank you for your consideration and I look forward to your reply.
>
> Sincerely,
>
> Young-Hui Chang

Remember, you will be an ambassador to our virtual guests. This means you will be their point of contact, provide instruction to them on how to interact via the listserve and provide the dates they will need to be available. YH will provide backup support so don't worry. You will also be responsible for contacting them ahead of time (at least 10-14 days in advance!) and reminding them again when the time comes. **It is also really important for the rest of the class to participate by chiming in with new and follow up questions.** When this discussion forum works, it works really well and everyone gets a really good exchange out of it.

Here are some possible topic areas considered in the past (also check out Wikipedia.org entries related to locomotion and previous class wiki pages):

•Modes
What are the differences/similarities between walking/swimming/flying?

•Scaling
What can we learn by comparing animals of different sizes? E.g., why is max. bone stress the same in a mouse and an elephant?

•Comparative locomotion
How is human walking/running similar to a dog walking/trotting? Or a crab? Where does galloping fit in?

•Environmental constraints
How does gravity affect locomotion? What if you walked/ran on Mars?

•Metabolic cost
What determines the cost of locomotion?

•Dynamics related issues (kinetics/kinematics), e.g.:
What are some basic dynamic templates that organisms use to locomote?

•Skeletal loading
What determines the skeletal loading patterns during locomotion?

•Muscle function
What do muscles do during locomotion?

•Modeling of locomotion
How do you model walking? Running? Galloping?

•Neural control
How does the nervous system control/contribute to locomotion?

•Development
How does ontogenetic development affect locomotion?

•Evolution
How does phylogeny (vs. environmental factors) influence locomotion?

•Stability vs. maneuverability
How do we balance when we locomote? How do we destabilize ourselves in order to maneuver?

•Gaits and gait transitions
What is a gait? Why are there gaits? Why do we switch gaits?