

**Course syllabus**

<b>Date</b>	<b>Topic/Description</b>	<b>Lecturer</b>	<b>Reading material</b>
1/27/06	Organizational meeting (Talbot library, 3 pm)	Colecraft	
2/2	<b>Course overview: the universality and versatility of Ca signals</b>	Colecraft	<i>Nat.Rev.Mol.Bio.</i> (2000) 1:11-21 <i>JBC</i> , (1985) 260:3440-50.
2/3	<b>Measuring intracellular Ca<sup>2+</sup> signals I: principles of fluorescent indicators based on BAPTA, instrumentation.</b>	Colecraft	<i>Nat.Rev.Mol.Bio.</i> (2003) 4:579-586
2/9	<b>Measuring intracellular Ca<sup>2+</sup> signals II: genetically encoded Ca<sup>2+</sup> sensors, fluorescence resonance energy transfer.</b>	Colecraft	<i>Nature</i> (1997), 388:882-887
2/10	<b>Student paper presentation</b>	<b>Yang</b>	<i>J.Neurosci.</i> (2004), 24:9572-79 <i>J.Neurosci.</i> (2005), 25:4766-78
2/16	<b>Transfer function for a troponin C-based genetically encoded Ca indicator</b>	<b>Tay</b>	
2/17	<b>No class (Biophysical Society Meeting)</b>		
2/23	<b>Electrical Signals I: Hodgkin-Huxley equations, basis of cellular excitability.</b>	Colecraft	Hille, Chapters 1-2
2/24	<b>Electrical Signals II: Structure and function of ion channels</b>	Colecraft	Hille, Chapter 3
3/2	<b>Student paper presentation</b>	<b>Tseng</b>	<i>Nature</i> (2003), 423:42-48.
3/3	<b>Student paper presentation</b>	<b>Suhail</b>	<i>Nature</i> (2005), 436:852-6.
3/9	<b>Ca<sup>2+</sup> entry pathways I: voltage-gated Ca<sup>2+</sup> channels.</b>	Colecraft	Hille, Chapter 4
3/10	<b>Ca<sup>2+</sup> entry pathways II: ligand-gated Ca<sup>2+</sup> channels, TRP channels</b>	Colecraft	<i>Nature</i> (2003), 426:517-24
3/16	<b>Student paper presentation</b>	<b>Sekar</b>	<i>Cell</i> (2004) 119:19-31 <i>J.Neurosci.</i> (2001) 21:1137-47.
3/17	<b>Student paper presentation</b>	<b>Lim</b>	<i>Nature</i> (2005) 437: 902-5. <i>Nature</i> (2004) 748:754.
3/23	<b>No class (Spring break)</b>		
3/24	<b>No class (Spring break)</b>		
3/30	<b>Feedback regulation of ion channels by Ca<sup>2+</sup>: Ca<sup>2+</sup> dependent inactivation and facilitation of voltage-dependent Ca<sup>2+</sup> channels, Ca<sup>2+</sup> regulation of K<sup>+</sup> channels.</b>	Colecraft	
3/31	<b>Interplay between plasma membrane and intracellular Ca<sup>2+</sup> channels: Ryanodine and IP<sub>3</sub> receptors, Ca-induced Ca release, cardiac EC coupling, Ca<sup>2+</sup> oscillations.</b>	Colecraft	
4/6	<b>Optical detection of elementary Ca<sup>2+</sup> release events: Ca<sup>2+</sup> sparks and puffs.</b>	Colecraft	
4/7	<b>Student paper presentation</b>	<b>Bailey</b>	<i>Nature</i> (2001) 410:592-596 <i>PNAS</i> (2004) 101:3979-84.
4/13	<b>Student paper presentation</b>	<b>Ballard</b>	<i>Nature</i> (2004) 407:870-76.
4/14	<b>Ca<sup>2+</sup> signaling in neurons: synaptic transmission; dendritic spines, optical fluctuation analyses in spines.</b>	Colecraft	
4/20	<b>Student paper presentation</b>	<b>Bazzazi</b>	<i>Nature</i> (2000) 408:589-593
4/21	<b>Ca<sup>2+</sup> regulation of gene expression</b>	Colecraft	
4/27	<b>Student paper presentation</b>	<b>Castillo</b>	<i>Science</i> (2001) 294:333-339
4/28	<b>CaM kinase: a Ca<sup>2+</sup> oscillation frequency decoder.</b>	Colecraft	

5/3  
5/5

*Student paper presentation*  
*Ca<sup>2+</sup> channelopathies*

**Marr** *Science* (1998), 279:227-230  
Colecraft

**Meeting Times:**

Lectures: Th 3:30-5:00p, Ross 529; F 3:30-5:00p West Lecture Hall  
Office hours: by appointment.

**Contacts:**

Course Director: Dr. Henry Colecraft, hcolecr1@jhmi.edu  
Teaching Assistant: Lai Hock Tay, ltay@bme.jhu.edu

**Course mechanics:**

Course notes will be posted on course web page, along with links to reading materials.

For undergrads, grading is determined from homework (60%) and a final exam (40%). For graduate students, grading is determined from homework (40%), class presentations (20%) and final exam (40%). Homework, when assigned, will be posted on Thursdays and is due in Traylor 726 on the Friday of the following week after class.

The final exam will be 3 hours in duration, starting at the usual lecture time.