

## **BISC 461- Applications of Light Microscopy to Cell Biology**

Fall 2018

This course covers 15 papers on different applications of microscopy to the study of cell biology. Each week a different student will present one of the papers listed below and will be responsible for explaining the technology used in the paper and the experiments that were performed. In addition, the student will lead a discussion on the relative merits of the paper. The following papers will be presented:

### **Papers:**

1. Fischer, M., S. Kaech, et al. (1998). "Rapid actin-based plasticity in dendritic spines." Neuron **20**(5): 847-854.
2. Emptage, N., Bliss, T.V.P. and Fine, A. (1999). "Receptor-Mediated Release of Calcium from Internal Stores in Hippocampal Dendritic Spines" Neuron, **22**, 115–124,
3. Maletic-Savatic, M., R. Malinow, et al. (1999). "Rapid dendritic morphogenesis in CA1 hippocampal dendrites induced by synaptic activity [see comments]." Science **283**(5409): 1923-1927.
4. Miesenböck, G., D. A. De Angelis, et al. (1998). "Visualizing secretion and synaptic transmission with pH-sensitive green fluorescent proteins." Nature **394**(6689): 192-195.
5. Patterson, G. H. and J. Lippincott-Schwartz (2002). "A photoactivatable GFP for selective photolabeling of proteins and cells." Science **297**(5588): 1873-1877.
6. Betzig, E., G. H. Patterson, et al. (2006). "Imaging intracellular fluorescent proteins at nanometer resolution." Science **313**(5793): 1642-1645.
7. Miyawaki, A., J. Llopis, et al. (1997). "Fluorescent indicators for Ca<sup>2+</sup> based on green fluorescent proteins and calmodulin." Nature **388**(6645): 882-887.
8. Nakai, J., Ohkura, M., and Imoto, K. "A high signal-to-noise Ca<sup>2+</sup> probe composed of a single green fluorescent protein" Nature Biotechnology **19**:137-141 (2001).
9. Chen, T.W., Wardill, T.J., Sun, Y., Pulver, S.R., Renninger, S.L., Baohan, A., Schreiter, E.R., Kerr, R.A., Orger, M.B., Jayaraman, V., Looger, L.L., Svoboda, K., Kim, D.S. Ultrasensitive fluorescent proteins for imaging neuronal activity. Nature **499**(7458):295-300 (2013).
10. Zhang, F., L. P. Wang, et al. (2007). "Multimodal fast optical interrogation of neural circuitry." Nature **446**(7136): 633-639.
11. Wu, Yi, Frey, D., Lungu et al. (2009). A genetically encoded photoactivatable Rac controls the motility of living cells Nature **461**(7260):104-8.

12. Livet J, Weissman TA, et al. (2007) Transgenic strategies for combinatorial expression of fluorescent proteins in the nervous system. *Nature* 450(7166):56-62.
13. Huisken, J., Swoger, J., Del Bene, F., Wittbrodt, J., Stelzer, E.H. Optical sectioning deep inside live embryos by selective plane illumination microscopy. *Science* 305(5686):1007-9 (2004).
14. Fosque, B.F., Sun, Y., Dana, H, et al., Neural circuits. Labeling of active neural circuits in vivo with designed calcium integrators. (2015) *Science* 347(6223):755-60.
15. Gross, G.G., Junge, J.A., Mora, R., Kwon, H-B., Olson, C.A., Takahashi, T.T., Liman, ER, Ellis-Davies, G.E.C, McGee, A.W, Sabatini, B.L., Roberts, R.W. and Arnold, D.B. Recombinant probes for visualizing endogenous synaptic proteins in living neurons. *Neuron* 78(6):971-85 (2013).

**Course Coordinator:** Don Arnold    RRI 204b    P: 821-1266    F: (213) 821-1818  
[darnold@usc.edu](mailto:darnold@usc.edu)    Office Hours: M 2:00-3:00 PM

**Textbook:** None

**Time and Place:** 4:00-5:50 PM, RRI 321.

**Grading:** The grades for the course will be determined by the presentation (50%), class participation (10%) and questions (40%). Every student must bring a question about the paper to be discussed to each class. After the class, the questions will be collected and graded.

**Disabilities.** Students requesting academic accommodations based on a disability are required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP when adequate documentation is filed. Please be sure the letter is delivered to Dr. Arnold as early in the semester as possible. DSP is open Monday-Friday, 8:30-5:00. The office is in Student Union 301 and their phone number is (213) 740-0776.

**Disclaimer:** It may be necessary to make some changes in the syllabus during the semester.

## **Statement on Academic Conduct and Support Systems**

### **Academic Conduct:**

Plagiarism – presenting someone else’s ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, “Behavior Violating University Standards” [policy.usc.edu/scampus-part-b](http://policy.usc.edu/scampus-part-b). Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, <http://policy.usc.edu/scientific-misconduct>.

### **Support Systems:**

Student Counseling Services (SCS) – (213) 740-7711 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.  
[engemannshc.usc.edu/counseling](http://engemannshc.usc.edu/counseling)

National Suicide Prevention Lifeline – 1 (800) 273-8255

Provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week. [www.suicidepreventionlifeline.org](http://www.suicidepreventionlifeline.org)

Relationship and Sexual Violence Prevention Services (RSVP) – (213) 740-4900 – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender-based harm. [engemannshc.usc.edu/rsvp](http://engemannshc.usc.edu/rsvp)

### **Sexual Assault Resource Center**

For more information about how to get help or help a survivor, rights, reporting options, and additional resources, visit the website: [sarc.usc.edu](http://sarc.usc.edu)

Office of Equity and Diversity (OED)/Title IX Compliance – (213) 740-5086

Works with faculty, staff, visitors, applicants, and students around issues of protected class.  
[equity.usc.edu](http://equity.usc.edu)

### **Bias Assessment Response and Support**

Incidents of bias, hate crimes and microaggressions need to be reported allowing for appropriate investigation and response. [studentaffairs.usc.edu/bias-assessment-response-support](http://studentaffairs.usc.edu/bias-assessment-response-support)

### **The Office of Disability Services and Programs**

Provides certification for students with disabilities and helps arrange relevant accommodations.  
[dsp.usc.edu](http://dsp.usc.edu)

Student Support and Advocacy – (213) 821-4710

Assists students and families in resolving complex issues adversely affecting their success as a student EX: personal, financial, and academic. [studentaffairs.usc.edu/ssa](http://studentaffairs.usc.edu/ssa)

### **Diversity at USC**

Information on events, programs and training, the Diversity Task Force (including representatives for each school), chronology, participation, and various resources for students. [diversity.usc.edu](http://diversity.usc.edu)

#### USC Emergency Information

Provides safety and other updates, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible. [emergency.usc.edu](http://emergency.usc.edu)

USC Department of Public Safety – UPC: (213) 740-4321 – HSC: (323) 442-1000 – 24-hour emergency or to report a crime.

Provides overall safety to USC community. [dps.usc.edu](http://dps.usc.edu)