10th Annual
Hardware and Software Experiments to Teach Undergraduate Neuroscience
- Curriculum Development Workshop (22-27 May 2016)

EXPENSES for participants to be paid by the National Science Foundation (NSF) during 2015 and 2016!

The University of Missouri-Columbia Colleges of Engineering and Biological Sciences will host a 6-day interdisciplinary workshop focused on active learning in neuroscience using virtual (software) labs from Sunday- Friday, May 22-27, 2016 on the Columbia campus. This workshop is targeted to undergraduate faculty (your can also bring one student with expertise in computers/software during 2015-16) from biological sciences, psychological sciences and engineering and to high school teachers with an interest in teaching and learning more about neuroscience using software-based instructional modules. The workshop was initiated in 2007 as part of a National Science Foundation grant to MU to develop undergraduate curriculum in the area of computational neuroscience, and continues to be offered free beyond the duration of the grant.

In recent years, Computational Neuroscience has developed tools to abstract and generalize principles of neural function using mathematics. These tools have proven powerful for research in a wide neuroscience spectrum including molecular, cellular, and systems levels. However, computational methods also provide valuable tools for teaching neuroscience. Several comprehensive, yet easy to use software packages to model neurons and networks, which can be used in teaching, are available at low costs. Neural models can be used alone, or together with simple biological experiments to demonstrate basic neurobiological concepts, and give students hands-on experience, to significantly improve the student’s learning experience.

The workshop will introduce one hardware and seven software experiments in the form of ‘virtual labs’ which can be directly incorporated into existing neurobiology or physiology courses, or used for the development of new courses. The hardware experiment covered in the workshop can be custom build locally at low cost (all instructions to build it will be provided). Workshop participants are supplied with ‘ready to use’ electronic versions of all hardware and software experiments, and of all the lectures.

Prior to arrival on campus - A primer we developed ‘Basics of Neurobiology’ will be sent to participants a month prior to Workshop. Participants are also provided access to the Blackboard site with all materials.

<table>
<thead>
<tr>
<th>Saturday evening prior to Workshop (6-9 pm)</th>
<th>Review of Neurobiology and electrophysiology</th>
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<tbody>
<tr>
<td><strong>Morning (8 am - 12 pm)</strong></td>
<td><strong>Afternoon (1 pm - 5 pm)</strong></td>
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<td>Sunday, Basic Math: derivatives and integration</td>
<td>Hardware Expt. 1 – Recordings of earthworm sensory and muscle potentials; Math in Bio</td>
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<td>Biology: Resting potential and GHK-equation</td>
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<td>Monday, Voltage-gated channels and AP; Math in Bio</td>
<td>Software Expts. 1 &amp; 2 – Rest and AP; Math</td>
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<td>Tuesday, Bursting; Synaptic transmission; Attendees Teach</td>
<td>Software Expt. 3 – Bursting; Attendees Teach</td>
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<td>Wednesday, Soft. Expt 4: Spiking using synapses; Teach</td>
<td>Soft. Expt. 5: Central pattern generator; Teach</td>
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<td>Thursday, Soft. Expt 6: Modeling earthworm escape reflex using synapses and neurons; Attendees Teach</td>
<td>Soft. Expt. 7: Modeling networks - short term memory, half-center oscillator, etc; Teach</td>
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<tr>
<td>Friday, Attendees Teach; Ideas for software experiments</td>
<td>Teach; Develop Ideas for software experiment</td>
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What will you get? Modules of ‘software’ experiments and one hardware experiment for use in a variety of courses in areas such as: physiology, psychology, engineering, …and even at the high school level; plans for building low cost neurobiology equipment for teaching and research; introduction to using software for experiments, ‘quantitative thinking’ in neuroscience; familiarization with the software package NEURON which is a powerful tool for teaching and research; contacts and comradeship with like-minded scientists and educators in the region; participation in a neuroscience support-network.

Location and accommodation: The workshop will be conducted on the University of Missouri-Columbia campus. During 2015-16, NSF will pay expenses for lodging and meals at the University dorms which has single and double occupancy rooms. Note that we cannot cover the costs for staying outside campus (we can only reimburse at the dorm rate/day). Faculty can optionally bring one other faculty member or student from physics/math/computer science disciplines, with interest in neuroscience – their expenses will also be covered.

Cost: During 2015 and 2016, NSF will pay for all expenses (for optional other attendee also) including travel, accommodation at University dorms, and meals at the dorms. If you decide to stay off campus, we can only reimburse at the dorm rate/day. See next page for details.

Eligibility & Application process: Faculty at 2-year and 4-year colleges and universities, and high school teachers with interest in teaching neurobiology are eligible to apply. To apply, just complete the on-line application form at the site - http://engineering.missouri.edu/neuro/outreach/neuroscience-workshop/

For further information about the workshop, contact Drs. Satish S. Nair (573-882-2964; nairs@missouri.edu), David J. Schulz (573-882-4067; schulzd@missouri.edu), or David Bergin (573-882-1303; bergind@missouri.edu)

Application Deadline: March 30, 2016. (see following page for additional information about the NSF project)
Greetings!

A team at University of Missouri has received funding for 2015&16 from the National Science Foundation for a project titled “Interdisciplinary Training in Neuroscience for Faculty and Undergraduates from 2- and 4-year Institutions”. PI: Dr. Satish Nair, Co-PIs: Dr. David Schulz, Biology; and Dr. David Bergin, Evaluator

What is the project about? The goal of this IUSE project is to build on past successes to both enhance teaching expertise of faculty, and increase undergraduate capacity in neuroscience at 2- and 4-year institutions. This goal will be achieved by meeting the following objectives: (i) Provide training in teaching undergraduate neuroscience, emphasizing computation via free software experiments to faculty-student teams via 1 week summer workshops; (ii) Provide additional training in math, software, teaching and development of curricular modules to 4 faculty-student teams via an intensive 2 week curricular development program; (iii) Provide year-round follow up for all participants to help them develop and implement software modules into their curriculum; and (iv) Identify barriers to learning (students), and to professional development and implementation of curricular modules (faculty and administrators) that limit increasing undergraduate capacity in neuroscience, by surveys and focus group meetings.

HOW CAN YOU BENEFIT?

1. By attending at the fully paid 6-day Workshop from 22-27 May 2016 (see previous page for details). We will be recruiting a total of 12 faculty for this 6-day workshop. All expenses including travel, and lodging + meals at University dorms will be paid by NSF. Pl. note that we cannot pay for expenses if you decide to stay off-campus; we can only reimburse at the dorm rate/day to cover such lodging. As stated on the previous page, you can also bring (optional) another faculty member or student from physics/math/computer science with interest in neuroscience.

2. By attending the paid two-week Curricular Development Program that follows the workshop. This curricular development program will be limited to four faculty-student teams. For those attending this two-week session NSF will, in addition to paying for all other expenses as above, also pay a honorarium of $500 (per faculty) and $250 (per student).

SELECTION OF PARTICIPANTS

The PIs will select the top 12 faculty applicants (plus optional other attendee) based on the quality of the application packet, statement of interest, underrepresented status of applicants, and vitae. Applications will be accepted only via the on-line website - http://engineering.missouri.edu/neuro/outreach/neuroscience-workshop/

Faculty for the 6-day Workshop (22-27 May 2016): A strong interest in and plans to implement computation and active learning neuroscience modules into existing or new course(s) is required. Past attendees are welcome. Before you apply via the on-line site, you will need a 1-page statement of interest – indicate course(s) you teach or plan to teach, and how the workshop may possibly enhance it, and have your curriculum vitae ready. Faculty can optionally bring another faculty or student from physics/math/computer science/…. with interest in neuroscience – their expenses will also be covered. Limited to 12 faculty teams (optional faculty/faculty or student/team; while we strongly encourage bringing another faculty member or student along, it is not a requirement, i.e., you can participate individually also)

Faculty-Student Teams for the Curricular Development Program (May 31 – June 4, 2016): We will also select 4 interested faculty-student teams for the two-week Curricular Development Program that will follow the Workshop. In addition to the criteria above, the applicant should have an interest in developing new curricular modules for their existing or planned course(s). Again, faculty can optionally bring another faculty or student from physics/math/computer science/…. with interest in neuroscience – their expenses will also be covered. This curricular development program will be limited to four faculty-student teams. As for the Workshop above, while we strongly encourage bringing another faculty member or student along, it is not a requirement.

Optional other attendee (faculty or student from Physics/Math/Computer Science): Include resume, transcript if student, and a 1-page statement expressing interest in neuroscience and in the usage of software for teaching. For students, we will especially emphasize a proven aptitude with science and math (as determined by their transcript) and their interest in software, and in our program.