12th Annual
Hardware and Software Experiments to Teach Undergraduate Neuroscience - Curriculum Development Workshop (19-22 June 2018)

Partial costs for participants paid from a National Science Foundation grant during 2018 – details below

The University of Missouri-Columbia Colleges of Engineering and Biological Sciences will host a 4-day interdisciplinary workshop focused on active learning in neuroscience using virtual (software) labs from Tue- Friday, June 19-22, 2018 on the Columbia campus. This workshop is targeted to undergraduate faculty 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 uses the low-cost spiker box from Backyard Brains (https://backyardbrains.com/). 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 - Participants are also provided access to a Canvas site with all materials, which will have NEURON installation instruction and basic exercises related to math and neurobiology to be completed prior to arrival.

<table>
<thead>
<tr>
<th>Prior to arrival on campus</th>
<th>Morning (8 am - 12 pm)</th>
<th>Afternoon (1 pm - 5 pm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel to Mizzou campus</td>
<td>Tuesday evening (7 pm -9 pm), Biology: Neurobiology fundamentals and basic elemental laws, Nernst/rest potential, GHK-equation</td>
<td></td>
</tr>
<tr>
<td>Wednesday: Biology &amp; Theory; Software Expts. 1 &amp; 2 – Rest and Action Potential, after introduction of Biology and Modeling ideas</td>
<td>Hardware Expt. 1 – Recordings of cricket action potentials using spiker box; Homework - Complete work daily and submit Voltage-gated channels and AP;</td>
<td></td>
</tr>
<tr>
<td>Wednesday, Bursting and synaptic transmission – biology and theory; Software Expt. 3 – Burster Cell, and Expt. 4: Synaptic transmission and modeling earthworm escape reflex</td>
<td>Complete all Homeworks; Discussion of Software Expts. 1-3</td>
<td></td>
</tr>
<tr>
<td>Thursday, Central pattern generator and simple networks: Soft. Expts. 5: Central pattern generator, and Expt. 6: Modeling networks - short term memory, half-center oscillator</td>
<td>Complete all Homeworks; Discussion of Software Expts. 4-6; Evening: Dinner-local restaurant (on your own)</td>
<td></td>
</tr>
<tr>
<td>Friday, Knowledge Survey; Discussion of all Software Expts.</td>
<td>Ends at 12:00 noon on Friday</td>
<td></td>
</tr>
</tbody>
</table>

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 host 15 faculty, and will be conducted on the University of Missouri-Columbia campus. Accommodation is available in University dorms which has single and double occupancy rooms. Or you can stay outside campus and make your own arrangements.

Cost: During 2018, an NSF grant will cover expenses associated with lodging + meals at University dorms. If you decide to stay off campus, we can only reimburse at the dorm rate/day. Note that you will be responsible for covering all travel costs.

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, 2018 (see following page for additional information about the NSF project).
Greetings!

A team at University of Missouri has received funding for 2015-16 (extended to 2017) 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. The project has been extended for one more year, and so participants in 2017 will receive partial funding for attending the workshops.

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) We can also provide focused training in developing your own tailored software experiment using NEURON; (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 4-day Workshop from 19-22 June 2018 (see previous page for details). We will be recruiting a total of 15 faculty for this 4-day workshop. All costs except travel (which you need to bear) will be paid from the grant. Specifically, expenses for lodging + meals at University dorms will be paid from an NSF grant. PI 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. You are encouraged to bring (optional) another faculty member or from physics/math/computer science with interest in neuroscience.

SELECTION OF PARTICIPANTS (15 seats available)

The PIs will select the top 15 faculty applicants 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/

Statement of interest: Interest 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 lodging and meal expenses will also be covered.

Optional other attendee (faculty colleague from Physics/Math/Computer Science): Include resume, and a 1-page statement expressing interest in neuroscience and how you may collaborate in teaching and/or research.