

Northeast Under/graduate Organization for Neuroscience, A Regional Neuroscience Meeting for Undergraduates, Graduate Students, and Faculty

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The Northeast Under/graduate Organization for Neuroscience (N.E.U.R.O.N.) was established in 1996 to provide a forum for undergraduate and graduate students and faculty in neuroscience to interact with each other. N.E.U.R.O.N. organizes a yearly one-day conference in the Northeast. While scientific meetings exist that serve the purpose of enhancing undergraduate research or neuroscience research, N.E.U.R.O.N. is unique in that it is a small, local

conference, aimed specifically at undergraduates looking to pursue careers in neuroscience. During the conference, participants attend workshops, poster sessions, and a keynote address that provide them with information about current topics in neuroscience. Trainees gain valuable experience presenting scientific research in poster sessions and make connections with colleagues.

Neuroscience is a relatively new integrative and multidisciplinary scientific discipline that encompasses, psychology, biology, and neurology. The number of neuroscience training programs has increased dramatically in recent years (Cleland, 2002), particularly among small colleges. Although trainees in these programs benefit considerably from the individualized attention they receive from their mentors, a shortcoming can be that students are not exposed to multiple perspectives or levels of analyses that are hallmarks of the field. While scientific meetings exist that serve the purpose of integrating scientific researchers, most of these meetings are not aimed at enhancing student-faculty interaction. For example, Society for Neuroscience (SfN), which brings together neuroscientists from all different areas of research is a very large, and would overwhelm most undergraduate students. The National Conference for Undergraduate research (NCUR), while an important resource for trainees, is not specific to neuroscience. To begin to address this problem, The North East Under/graduate Research Organization for Neuroscience (N.E.U.R.O.N.) was formed in 1996. The primary function of N.E.U.R.O.N. is to hold an annual conference that brings together those working on a range of topics, disciplines, and techniques within neuroscience, which reflects the integrative and multidisciplinary nature of the field. To begin to address this, N.E.U.R.O.N. was formed in 1996. The primary function of N.E.U.R.O.N. is to hold an annual conference that brings together those working on a range of topics, disciplines, and techniques within neuroscience, which reflects the integrative and multidisciplinary nature of the field. Since 1997, those working in a range of settings from the clinic to the bench, that use molecular, genetic, biochemical, and/or behavioral techniques to best address a range of questions, have participated in the annual N.E.U.R.O.N. conference. This article discusses the goals, history, progress, and future directions of N.E.U.R.O.N. and will hopefully encourage others with related interests to consider a similar approach to improving neuroscience training.



Fig. 1 Students at a 2004 N.E.U.R.O.N. poster session.

THE GOALS OF N.E.U.R.O.N.

N.E.U.R.O.N. strives to provide an open forum for undergraduate students and faculty with similar interests in neuroscience. N.E.U.R.O.N. also provides faculty with an opportunity to discuss curricular and research issues in neuroscience, biopsychology, and other related scientific areas. Through the annual conference, N.E.U.R.O.N. enhances communication and collaboration among neuroscience researchers and educators.

Each year, there is a one-day N.E.U.R.O.N. conference that provides a forum for undergraduate and graduate students to present their research and gain feedback from peers and faculty on research in which they are engaged during the academic year. The conference includes workshops that discuss important topical and pipeline neuroscience issues, top speakers who give keynotes on current topics in neuroscience, and a poster session that provides students with an opportunity to share their research with others. The diversity of this agenda provides an opportunity for all attendees to engage in science, while promoting and encouraging the development of neuroscience training.

The overriding interest that is shared by all N.E.U.R.O.N. participants is the interest in rigorous neuroscience and commitment to neuroscience education and development. This meeting is unique as the nurturance of neuroscientists in training is the sole focus of the meeting. Towards this end, a secondary goal of the meeting is to provide a forum for educators to come together for discussions of how to improve neuroscience training. N.E.U.R.O.N. provides excellent opportunities for collaboration (research and pedagogy) between the faculty and institutions that participate in the meeting. This translates into improved educational and experiential opportunities for the students of these faculty members.

An important goal of N.E.U.R.O.N. is to build the field of neuroscience from the bottom-up; hence, a meeting devoted to having student participants as the focus is essential. It is our aim to encourage neuroscientists in training and to continue to emphasize integration and cross-discipline approaches. The conference strives to serve these goals and provide an important bridge between undergraduate and graduate training programs and experiences, which will facilitate and encourage the entree of junior neuroscientists on to graduate and professional schools. Improving training opportunities is integral to ensure that there are future scientists and health care providers with appropriate scientific skills.

THE HISTORY OF N.E.U.R.O.N.

N.E.U.R.O.N. was conceived and established in 1996 by Drs. Cheryl Frye (SUNY-Albany), Priscilla Kehoe (Trinity College), and Cheryl McCormick (Bates College). A dialogue was initiated at a Neuroscience Education Training Conference held at Trinity College and supported by The Pew Charitable Trust through the New England Consortium of Undergraduate Science Education (NECUSE). Drs. Frye, Kehoe, and McCormick identified that there was no one conference that fills the needs of neuroscientists-in-training, educators, and those from different institutional backgrounds. They polled their colleagues to ascertain the level of interest in this endeavor and found others that were eager to be involved in an organization that had as its purpose the promotion of interaction between undergraduates, graduate students, and faculty at small colleges and universities throughout the region. The Northeast is an ideal geographical region for such a meeting, as most schools are within easy driving distance of one another. As such, N.E.U.R.O.N. was conceived of as a meeting with single sessions, which utilizes a range of educational approaches in order to bring the participants closer to topical material in neuroscience and to provide important input for furthering participants' development as neuroscientists (Blasberg et al., 2003a, b).

In order to establish N.E.U.R.O.N., a steering committee was formed. Initially, eight individuals, who assisted in the organization and recruitment of participants, comprised the steering committee. Although the steering committee continues to serve the same functions today, of encouraging participation and

providing input about the conference, it has expanded to over 30 members and institutions.

Having people who are involved in N.E.U.R.O.N. from different organizations function in different roles has been helpful. Basically, N.E.U.R.O.N. has been successful by keeping the organization as simple as possible. Founding organizers (Drs. Frye, Kehoe, and McCormick) have worked closely with local organizers at host institutions (Trinity, Wellesley, and Wheaton Colleges). The local organizers arrange and manage the site and accommodations for the meeting. Others, off-site, have handled the program, and other logistical aspects of the meeting, such as hosting keynote speakers and workshop leaders. By having a new institutional host every three years, it enables N.E.U.R.O.N. to truly be an organization that is embraced by the region and no one institution. Disseminating the work associated with the meeting has enabled it to not become too burdensome to any one individual.

Another important organizational tool that was central to the success of N.E.U.R.O.N. was the development of an effective web site. The web site was originally established by Dr. John Mitchell and administered through Boston College. The creation of this web site provided a central nexus for dissemination of information about N.E.U.R.O.N. As well, a counter that recorded the number of log-ins from new sites enabled us to collect data showing an interest in our group, which was important for our initial funding. After the web site was initiated and maintained for several years by Dr. Mitchell through Boston College, it was transitioned to U Mass Amherst where Dr. Geert de Vries managed it. Since 1999, Dr. David Tieman of The University at Albany has been the web master for the N.E.U.R.O.N. web site (www.albany.edu/N.E.U.R.O.N./). The web site is updated regularly to provide details about future meetings, progress of past meetings, and to serve as an important clearing house of contacts for steering committee members and educational programs in neuroscience.

An important factor that enabled N.E.U.R.O.N. to become established was initial funding provided by NECUSE and the first host institution, Trinity College. NECUSE, the organization that originally funded the conferences on neuroscience education from which the idea of N.E.U.R.O.N. grew, provided key financial support for the two initial meetings. As well, Trinity College also generously contributed funds for the keynote speakers at the first conferences and hosted the meeting for the first three years. Wellesley and Wheaton Colleges were the hosts in subsequent three year increments and provided integral support, as well. Initially, the other institutions represented by the steering committee also bore some of the expenses of photocopying and mailing announcements, calls for papers, and programs. With this grass roots support that provided for the first two meetings, we were able to collect preliminary data that demonstrated that the conference was engaging and effective, which was integral to garner further extramural support. The third year of funding was obtained by a one-year NIMH R13 grant. The fourth through eighth N.E.U.R.O.N. meetings

have been supported by a five-year NIMH R13 grant that began in 1999. This previous funding has allowed us to reach out to a number of trainees and faculty members involved in neuroscience research. It is our hope that we will continue to have financial support for this important educational venue.

EVALUATION OF N.E.U.R.O.N.

Each year at N.E.U.R.O.N., we have solicited feedback from participants about the meeting. This has been accomplished by asking participants to complete a one-page survey that includes both closed- and open-ended questions about each feature of the meeting. In particular, respondents are asked to rate the effectiveness of the keynote speakers, the workshops, the poster session, as well as other aspects of the meeting, using a 1-5 point Likert scale (with 1 being the lowest and 5 being the highest rating).

Keynote Speakers

N.E.U.R.O.N. has been a success in large part due to the interest and generosity of many leaders in the field of neuroscience. Each year, a prominent researcher is invited to give the keynote address on a current topic in neuroscience. This address provides faculty and trainees alike with the opportunity to learn about cutting-edge research. As Table 1 indicates, the majority of the keynote speakers have been current or past presidents of The Society for Neuroscience or members of The National Academy of Science. Some might question the utility of having such “high-powered” speakers interact with students. We have found that our speakers have been readily able to engage with students and that students have also benefited from having a related paper to read prior to the keynote talk. Notably, in addition to their talk, most of the keynote speakers have participated in the entire days’ activities. Keynote speakers have gone to great lengths to visit students’ posters, to meet with students over lunch, to attend the faculty workshops, and to talk with their colleagues (Frye et al., 1999).

Table 1: Past keynote speakers & ratings (on scale of 1-5)

Year	Speaker	Affiliation	Title	Rate
1997	Dr. Bruce McEwen	Rockefeller University	“Sex, stress, and synapses: Endocrinology and neuroscience combine forces”	5.0
1998	Dr. Pat Goldman-Rakic	Yale University	“Cortical memory systems”	4.5
1999	Dr. Robert Sapolsky	Stanford University	“Stress, neurodegeneration, and individual differences”	4.5
2000	Dr. Sandra Witelson	McMaster University	“Einstein and other brains”	4.5
2001	Dr. Ed Kravitz	Harvard Medical School	“Fighting lobsters: from genes to behavior”	4.5
2002	Dr. Donald Pfaff	Rockefeller University	“Hormonal and genetic influences on arousal of the brain, sexual and otherwise”	4.5
2003	Dr. Eve Marder	Brandeis University	“Stability and plasticity in adult and developing neural circuits”	4.2
2004	Dr. Huda Akil	University of Michigan	“Searching for the neural basis of mental illness”	4.4

Workshops

N.E.U.R.O.N.’s annual conference includes workshops for faculty and trainees, as well as a keynote address. Workshops led by expert consultants are offered to faculty and students to provide information about training and career development and opportunities. Participant suggestions have led to the development of separate workshops for undergraduates, graduate students, and faculty. Past

Table 2: Past workshops & ratings (on scale of 1-5)

Year	Audience	Speaker	Affiliation	Title	Rate
1997	Trainees	Various faculty	Various	Discussion groups on neuroscience topics	4.0
	Faculty	Dr. John Mitchell	Boston College	“Web resources for neuroscience”	3.1
1998	Trainees	Drs. Beth Fisher & Michael Zigmond	University of Pittsburgh	“Career options in neuroscience”	4.0
	Faculty	Dr. Annabella Segarra	NSF	“NSF grant writing”	4.2
1999	Trainees	Dr. Jacob Harney	University of Hartford	“Ethics in neuroscience”	4.0
	Faculty	Dr. Betty Zimmerberg	Williams College	“Web based teaching resources”	4.2
2000	Undergrad	Dr. Jim Stellar	North-eastern University	“Five easy steps on how to become a graduate student”	3.9
	Graduate	Dr. Cheryl McCormick	Bates College	“Life after graduate school”	3.2
	Faculty	Dr. Donald Buckley	Quinnipac College	“Using educational technology to foster active learning cognitive enhancement in science”	4.3
2001	Undergrad	Dr. Cheryl McCormick	Bates College	“So I studied neuroscience in college. What’s next?”	4.0
	Graduate	Dr. Jacob Harney	University of Hartford	“So I have a Ph.D. in neuroscience. What’s next?”	4.1
	Faculty	Dr. Sarah Raskin	Trinity College	“So, I know we want to develop our program in neuroscience. What’s next?”	3.5
2002	Undergrad	Dr. Cheryl McCormick	Bates College	“Post-undergraduate career paths”	4.0
	Graduate	Dr. Jacob Harney	University of Hartford	“The pros and cons of industry vs. academia”	4.1
	Faculty	Dr. Betty Zimmerberg	Williams College	“Pandering or pedagogy: using multi-media to teach neuroscience”	3.5
2003	Trainee	Dr. Joan King	Beyond Success	“Evoke your genius: Unlock your potential”	4.7
	Faculty	Dr. Su Tieman	University at Albany	“Teaching responsible conduct”	3.5
2004	Undergrad	Drs. Meg Kirkpatrick & Bob Morris	Wheaton College	“Life after college: graduate school and careers in neuroscience”	4.8
	Graduate	Dr. Su Tieman	University at Albany	“Ethics in neuroscience”	3.2
	Faculty	Dr. Jeff Blaustein	U Mass Amherst	“Journal reviews: read (and writing) between the lines”	4.4

workshops have included topics such as “Web-based Teaching Resources,” and “Teaching Responsible Conduct” for faculty members, and “Career Options in Neuroscience” and “Ethics in Neuroscience” for trainees (Table 2). In each of these cases, specialists in the area of the desired workshop provided training (Frye et al., 2000).

Posters

Each participant at N.E.U.R.O.N.’s annual conference is invited to present a poster. Over sixty posters were presented at the May 2004 meeting (Fig. 1, Table 3). During the poster session, students interact with faculty from different institutions and gain valuable experience in presenting research data. Students also receive constructive and informal feedback from neuroscience faculty. As well, student interactions during the poster session expose trainees to other areas of neuroscience research and allow for the opportunity to expand scientific interests. One-on-one discussions between and among trainees and faculty also provide students with information about graduate school and allow students to form important connections with potential advisors. Participant response has indicated that the poster session is one of the most enjoyable and useful aspects of the annual meeting. As a result of feedback that participants were interested in making their research available to others outside of the poster session, abstracts can now be published in N.E.U.R.O.N.’s associated journal (*Journal of Behavioral and Neuroscience Research*; academic2.strose.edu/Math_and_Science/flintr/jbnr/).

Table 3: Numbers of undergraduates, graduate students, faculty, posters presented, and institutions represented per year.

Year	Undergrads	Grad Students	Faculty	Posters	Institutions
1997	43	40	35	58	118
1998	62	52	41	66	155
1999	80	30	19	54	129
2000	62	52	41	68	155
2001	72	27	31	52	130
2002	81	24	33	49	138
2003	79	18	31	56	128
2004	75	19	42	60	143

Characteristics of Participants

A strength of N.E.U.R.O.N. has been the number of women involved. As Table 4 indicates, consistently more than 60% of the participants are women. This representation is not surprising given the founders are women neuroscientists, who have active laboratories with many students that have looked to them as important role models. Our present goals for N.E.U.R.O.N. include trying to involve greater numbers of racial and ethnic minorities and other persons from disadvantaged groups at the meeting. At our most recent meeting, participation by self-identified racial and ethnic minorities had increased to a high of 17%, up from a meeting low of 11% at the prior years meeting (Table 4).

Table 4: Percentages of women & racial/ethnic minority participants per year.

Year	% Women	% Racial & Ethnic Minorities
1997	60	13
1998	70	12
1999	64	18
2000	62	13
2001	60	14
2002	61	12
2003	78	11
2004	66	17

Another improvement at our recent meeting was trying to establish how many financially disadvantaged students participate in N.E.U.R.O.N. To address this we asked participants to complete questionnaires regarding financial aid information, so as to determine whether economically-disadvantaged students are benefiting from N.E.U.R.O.N. The results of this survey are shown in Table 5.

Given that N.E.U.R.O.N. is a regional conference that students can attend for free and with little travel costs, it may provide a particularly important service for students that do not have additional resources to travel to other conferences. For most students, this is their first or only conference experience and as such it can be a key factor in encouraging some students on to further professional training. This year, we have begun to “track” the future plans of our participants. Although 90% will stay in neuroscience, of these 66% will be in the same position whereas 24% will be moving on to attend graduate school in Neuroscience, attend medical school, or work as a technician in neuroscience.

Table 5: Percentages of students from disadvantaged backgrounds attending N.E.U.R.O.N. 2004.

	Receive Financial Aid	1 st Gen. Student	Disabled	1 st Gen. Immigrant	Job to pay for school	Work Study
Percent	66%	23%	5%	10%	35%	35%

THE FUTURE OF N.E.U.R.O.N.

N.E.U.R.O.N.’s success has allowed it to serve as a model for similar groups in other regions of the country. For example, S.Y.N.A.P.S.E., The Society of Young Neuroscientists and Professors of the SouthEast (<http://csm.jmu.edu/biology/clelancl/SYNAPSE/>) was developed using N.E.U.R.O.N. as a model (Blasberg et al., 2003a, b; Frye et al., 1998; Talley et al., 2003; Morgan et al., 2004). We want to continue and expand the efficacy of N.E.U.R.O.N. in the hopes that it can be used further as an example by other groups to encourage neuroscience training and education. We hope to accomplish this goal by hosting a meeting such as Project Kaleidoscope (PKAL) concurrent with N.E.U.R.O.N. at Wheaton College, which would highlight the aspects of the meeting that make it a superb model for other groups that want to enhance neuroscience education and research. In hopes of creating greater community integration, N.E.U.R.O.N. has begun to contact local chapters of the Society for Neuroscience throughout the Northeast. Response to this outreach thus far has been wholly positive. Contacts with these chapters will enable regional chapters to utilize

N.E.U.R.O.N. as an educational activity, will help increase involvement of the scientific community, and provide a possible source of funding for future meetings.

In order to further increase representation by all types of minorities at future N.E.U.R.O.N. meetings the venue of the meeting will change in 2006 to a more urban setting. Two possible sites are SUNY-Albany and Northeastern University. Racial and ethnic minority students make up 23 and 17.4%, respectively, of the student body at these institutions and many students are economically disadvantaged.

Other approaches to make N.E.U.R.O.N. as inclusive as possible will be to provide more financial support for students and other role models. We hope to provide travel awards, with priority given to students from under-represented groups. A concerted effort will also be made to increase the number of minority mentors/speakers at N.E.U.R.O.N. Indeed, the keynote address next year will be given by Dr. Erich Jarvis of Duke University Medical Center. In addition to his talk entitled, "Birdsong and the Neurobiology of Human Language," Dr. Jarvis will speak about his path to success in neuroscience. Workshops are also planned to increase awareness of minority issues in neuroscience training. We believe that these measures will increase the participation of under-represented groups at N.E.U.R.O.N. In order to make N.E.U.R.O.N. as inclusive as possible, we have also expanded the N.E.U.R.O.N. steering committee to include faculty from larger institutions, many of which have world-renowned neuroscience training programs.

Another goal of N.E.U.R.O.N. is to expand our community outreach. To date, our lab has held very successful events for Brain Awareness Week, including a Brain Bee and lab tours for high school students. We have also recently begun to involve high school science teachers in research through NSF-funded Research Experience for Teachers programs. These projects enhance science in high schools and expose students to neuroscience research at a critical period when they are figuring out career path(s) they may be interested in. These and other methods of community outreach will be the topics of workshops at N.E.U.R.O.N. and PKAL. We hope this will further our goal of enhancing neuroscience education, research, and outreach, which enhances science literacy in the community.

Because this group is committed to the integration of traditional and non-traditional approaches in neuroscience, it is essential to have a regularly held forum where interactions among scientists with a variety of training backgrounds and perspectives can be developed and fostered. Thus far, N.E.U.R.O.N. has reached over one thousand participants. Annual meetings of N.E.U.R.O.N. give students and faculty a formal voice and a mechanism for meeting and exchanging ideas on a regular basis. It is our hope that by continuing to offer these opportunities at N.E.U.R.O.N. and further promoting greater networking and contacts between the participating individuals and institutions, that such contact will be sought and maintained between annual conferences.

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