

## Commentary

# We've Got NERVE: A Call to Arms for Neuroscience Education

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Are we neuroscientists doing our part to help revive science education, to stimulate teachers' ingenuity, and diversify the intellectual capital among the next generation of scientists? Certainly we support progressive initiatives, including a major international Brain Awareness Campaign, local chapter grants for Society for Neuroscience (SfN) members, and activist committees for media relations, but are we doing enough? To enable neuroscientists worldwide to step out of the laboratory or office periodically to visit nontraditional neuroscience education venues, the Society for Neuroscience Public Education and Communication Committee has launched NERVE, the Neuroscience Education Resources Virtual Encycloportal (Fig. 1). This web-based compendium of teaching materials went live in September 2008 and has already received >10,000 visits from >100 countries around the globe. NERVE's offerings are many: videos to stimulate discussion at town hall meetings, lesson plans for visits to local schools, and hands-on activities to break up long lectures, just to name a few. Regardless of the topic or venue, NERVE aims to meet our neuroscience education needs.

The state of science education today surely calls for our involvement. Scientific advance has always required nurturing young minds and bringing fresh perspectives into the scientific community, but high demands on often under-prepared teachers working in ill-equipped classrooms can result in some uninspiring science education efforts and a decline in the

versatility of the global workforce. One alarming example is that only 28% of United States high-school students are well prepared for college-level biology (American College Testing, 2008). Particularly now that we are faced with a global economic crisis, threats to environmental stability, and rapidly expanding technological demands, scientists and teachers worldwide need to revolutionize their approaches to education (DeHaan, 2005) and avoid declines in science literacy that may jeopardize scientific advancement and future economic growth [National Science Board (NSB), 2004; Teachers College, 2005; Committee for Economic Development (CED), 2006; American Electronics Association, 2007].

Recommendations for change in education emphasize active teaching and learning approaches, real-world applications, problem-based formats, and inquiry in and outside the classroom [National Research Council (NRC), 1996, 2000, 2003a,b, 2005; NSB, 2004; CED, 2006]. Neuroscience, with its many facets, lends easily to these approaches (Moreno, 1999; Cameron and Chudler, 2003). The study of brains, nervous systems, and behavior has wide appeal to learners of all ages with curiosities and concerns in areas such as learning and neurogenesis, memory loss and neurodegenerative disease, drug addiction and stress, traumatic brain injury and posttraumatic stress disorder, phantom limbs, savantism, and even synesthesia. Interactive models, exciting videos, and detailed graphics can effectively demonstrate basic concepts in neuroscience, as can excited neuroscientists. We can and must play a role in ensuring that education systems produce the next generation of critically needed scientists and innovators.

In fact, neuroscientists have both the opportunity and the responsibility to serve their communities as stewards of science (Zardetto-Smith et al., 2006). As members of the SfN, we should endorse the mission of the Society, which exhorts us to "promote public information and general education about the nature of scientific discovery and the results and implications of the latest neuroscience research" (Society for Neuroscience, 2009). Many Society members heed this call already by leading Brain Awareness Campaigns around the globe, promoting and obtaining grants for education initiatives, and providing countless informal classroom visits, lab tours, and research apprenticeships. Underscoring these important steps toward emphasizing education, 50% of SfN members wishing to be more involved in the Society expressed a specific desire to participate in public education and outreach to schools, according to a 2007 membership survey (Society for Neuroscience, 2007). Nevertheless, our field lags behind others. Physicists teamed up a decade ago to create a Force Concept Inventory that probes student understanding of basic ideas related to Newtonian force (Hestenes et al., 1992). This inventory is based on qualitative research that revealed student misconceptions; it has been validated in many student populations, and is disseminated widely for course assessment purposes. The American Physiological Society publishes *Advances in Physiology Education* and the American Society for Cell Biology together with the Howard Hughes Medical Institute publishes *CBE—Life Sciences Education*; both are quarterly education journals. Peer-reviewed publications in these journals report results from education research partnerships between edu-

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**Figure 1.** NERVE home page.

cation and basic science faculty members, and provide data on the best practices for teaching physics and life sciences. Neuroscientists should work toward establishing the core faculty members, community, goals, and partnerships that will support them in igniting the interests of our novice, but very curious, student counterparts.

To progress toward providing solid neuroscience education for all members of our local communities, the Society for Neuroscience Public Education and Communication Committee presents NERVE. This web-based Neuroscience Education Resources Virtual Encycloportal is as jam-packed with teaching and learning links as it sounds. The purpose of NERVE is to provide easy access to good education tools. Hundreds of resources are categorized and searchable by general topic, grade level, format (e.g., web resource, video, PDF), or a Google search within the site. NERVE is dynamic, updated weekly, and invites users to submit new resources, suggest additional topics, and provide feedback. With many resources aligned to United States national science education teaching standards (NRC, 1996), it is easy to identify learning objectives to help fulfill classroom re-

quirements. At our fingertips, we will be pleased to find resources such as “Dangerous Decibels,” a K–8 curriculum on the anatomy and physiology of hearing, hearing loss, and noise pollution. Already complete with online interactive games and diagrams, a downloadable teacher’s guide, and worksheets to help assess student learning, “Dangerous Decibels” (or other modules like it) can easily be combined with a short slide presentation on our own neuroscience research to round out exciting and informative classroom visits. Alternatively, NERVE provides ideas for Brain Awareness activities, teacher professional development workshops, and even university classes. Many of the grade 9–12 resources are easily modified for more advanced students. If you would like to contribute resources to NERVE, please use the “Suggest a Resource” button on the site, which puts you in direct contact with the site curator.

Have we considered increasing our involvement in education initiatives, but felt hindered by the “publish or perish” realities of tenure dossiers and grant reviews? Consider this: science education research is a rigorous and well developed field of scholarly activity, complete with myriad peer-reviewed journals and a searchable

database, the Education Resources Information Center. In partnership with colleagues in education research, basic scientists can learn to take a scientific approach to teaching: make observations, identify a problem, search existing literature for theoretical explanations or methods of exploration, develop hypotheses, test them, modify hypotheses, repeat, and publish (Handelsman et al., 2004). The end result might help to transition activities often called “service” into accomplishments called “professional development” by contributing scholarly work to a diverse publication record including science education research reports, as well as basic clinical, bench, or field research reports.

With an area of scientific focus as intriguing and prominent as neuroscience, we owe it to the world to get involved in science education. To accelerate the progress already underway in neuroscience education, NERVE eases scientists from the lab into education settings by posting links to excellent education resources on many topics for various audiences. If we couple NERVE with a rigorous approach to our teaching opportunities, then we can contribute valuable data to the education research field while diversifying our own career

portfolios. So heed this call to education arms. We've got NERVE for neuroscience education; let's use it.

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