# NEUROSCIENCE QUARTERLY

WINTER 2006


*"The prospect of open access raises many questions that scientific societies and publishers must grapple with in order to ensure a viable financial model for their journals."*

*– SfN President Stephen Heinemann*

## *The Journal* Increases Access to Articles; Raises Fees for Submission, Publishing

On Jan. 1, 2006, the Society for Neuroscience changed *The Journal of Neuroscience*'s publishing policy to allow unrestricted access for the scientific community and the public to articles six months after publication. Previously, *The Journal*'s access control policy allowed non-subscribers to view articles 12 months after publication. In addition, the submission fee will rise to $75 and the publication fee to a flat $750 per regular article.

This new access policy is consistent with the trend toward opening access to published scientific research that is supported by Congress and patient advocacy

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SfN SOCIETY FOR NEUROSCIENCE

*Message from the President*

## Open Access Publishing Raises Questions; Online Forums to Provide Member Input

Moving *The Journal of Neuroscience* to a six-month open access policy (see article above for details) is in keeping with current trends in scientific publishing, which are transforming the way scientific societies and other publishers operate in the digital age. Organizations such as ours must think carefully about how to best serve the needs of authors, our membership, the scientific community at large, and the public in a rapidly changing publishing environment. This message aims to initiate a dialogue with SfN members about these issues, using a Web-based forum (see below) as a means to continue the discussion in an open and flexible format.

A widely held view among scientists is that open access represents the future of scientific publishing. The prospect of open access raises many questions that scientific societies and publishers must grapple with in order to ensure a viable financial model for their journals. Because open access means just that, scientific articles would be available without charge to everyone. Under open access, subscription income from libraries as well as individuals would largely disappear, leaving the question of who pays and how much.

The music and newspaper industries are already going through an "open access" experience in which information changes hands without money changing hands. This radical departure from traditional ways of publishing is likely to take years to sort out but will open new avenues for disseminating information.

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groups, as well as the National Institutes of Health (NIH), which is establishing an online collection of manuscripts from articles based upon research that it sponsors. In May 2005, the agency implemented its public access policy, which encourages all NIH-funded investigators to make their peer-reviewed final manuscripts available through the National Library of Medicine's free digital archive of journal articles, Pubmed Central (www.pubmedcentral.nih.gov), within 12 months of publication. The movement toward open access is also driven by readers who want unrestricted access to NIH-supported published research and by authors who want their results to be freely available.

*The Journal of Neuroscience* is one of the leading journals in its field, with 6,500 papers published between 1999 and 2004. *The Journal* publishes more research than the next five major neuroscience journals combined. *The Journal*'s 2004 Institute for Scientific Information impact factor was 7.91; it ranked 12th out of 198 journals in impact factor in the neurosciences category and continued to rank first in total citations in its category. In 2004, *The Journal* published more than 11,000 pages, and its Web site received more than 13 million hits and 2.7 million downloads. The Society recognizes that it must continue to preserve and improve this important resource.

A significant portion of the costs of operating *The Journal* goes toward maintaining the editorial structure and staff required to support *The Journal*'s high standard of peer review. On Jan. 1, 2006, the submission fee increased from $50 to $75, to partially defray the costs of peer review. This fee will now be pre-paid online, in much the same way that abstract fees are paid at the time of submission.

At its fall 2005 meeting, the SfN Council also approved the institution of a flat fee for publication rather than a fee based on the number of published pages, which will be collected after manuscript acceptance and before publication. *The Journal* currently has approximately $120,000 in unpaid page charge fees that are more than 30 days overdue. Under the new system, authors of manuscripts submitted on or after Jan. 1, 2006, will be charged a flat publication fee of $750 for a regular article and $375 for a Brief Communication. Likewise, reprint and offprint fulfillment will require pre-payment.

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*– SfN President Stephen Heinemann*

The current publishing model is based largely on institutional subscription revenue, which provides half of *The Journal*'s total revenues. Over the coming months, the Society will explore alternative models for financing *The Journal* should the institutional subscription base decline as the open access environment becomes established. One possible strategy is to shift more of the cost of publishing from libraries to researchers. Moving to such an "author pays" model, an approach put forward by many advocates of open access publishing, will require careful evaluation of whether it would best serve *The Journal*'s readers and authors, and the scientific community.

"The Society intends to be a leader in discussions about the future of science publishing, and *The Journal* can serve as an example of the possibilities afforded by the technologies and trends that are radically reshaping the publishing field," says Stephen Heinemann, president of the Society. "Maintaining the excellence of *The Journal* and the mission of the Society to promote the absolute best science while providing public access will remain the highest priority as we plan for the future." To this end, SfN is providing a structured opportunity through its Web site (http://forums.sfn.org) for members, authors, and readers to provide feedback. ■

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# Message from the President



Stephen Heinemann, SfN President

Similar challenges and opportunities arise in the realm of scientific publishing. Since the open access issue arose during the past few years, the topic has been extensively discussed both outside and inside the Society. Proposals for immediate open access to articles published in scientific journals have generated strong opinions both for and against the policy. Major proponents include Congress, patient advocacy groups, and the National Institutes of Health (NIH). These proponents argue that the taxpayer paid for the research and the results should be freely available. Open access is also consistent with the mission of the Society to promote research and to educate the public. NIH recently announced its NIH Public Access Policy (http://publicaccess.nih.gov/), which encourages (but does not require) deposition of manuscripts in PubMedCentral upon publication.

The financial implications of open access for *The Journal* arise because it currently derives much of its income from institutional subscriptions, as well as author fees and a portion of member dues. More information about *The Journal*'s current model can be found in the accompanying article on open access (see page 1).

To examine open access and its implications on our publishing operations, Council established in 2004 a publishing strategy working group charged with developing plans for SfN's scientific publishing program for the next five to ten years, including but not limited to *The Journal*. This group included Clif Saper, Huda Zoghbi, SfN Secretary Irwin Levitan, myself, and David Van Essen, who is now our president-elect and a former editor-in-chief of *The Journal*. We discussed publishing opportunities in four conference calls during a ten-month period ending last November. We also spoke with the outgoing and incoming publications committee chairs, Peter Strick and Sacha Nelson, and Editor-in-Chief of *The Journal*, Gary Westbrook.

The working group recognized that journals such as ours have a number of options for addressing a loss of subscription income. These include eliminating print to reduce production costs; identifying other ways to streamline the publication process; augmenting revenues by establishing a quasi-endowment for *The Journal*; increasing member dues transfers (currently $20 of every member's annual dues and totaling ~$750,000 for *The Journal*); raising submission fees; and raising publication fees. But such moves alone will not be sufficient to solve the problem. What alternative sources of revenue emerge in the digital age?

Elimination of print would provide substantial savings (approximately $1 million) and is under active consideration. Fortunately for SfN, our financial strength — due to the annual meeting, strong membership growth, and a new headquarters building that includes rental space as an additional revenue source — allow the Society to consider establishing a quasi-endowment for *The Journal* that could help keep author charges down.

These steps, while substantial, would not fill the void of nearly $3 million left by a complete loss of subscriptions. Hence, it is important to consider options involving additional payment from authors. Obviously, the potential revenue base associated with 6,000 submissions — the number received each year by *The Journal of Neuroscience* — exceeds that associated with 1,100 articles published. The $75 submission fee (newly increased from $50) only covers a fraction of the cost of peer review, which is about $300 per article consistent with industry norms. Altogether, the solution to emerging financial pressures will surely be based on a combination of the above options. It's a question of how much we should rely on one mechanism versus another.

Because it remains unclear if and when a completely open access environment will develop, the publications strategy working group concluded that we must start planning now for the possibility so that if and when it comes, it will not disrupt the operations of *The Journal*, and we will be in a better position to take advantage of a new publication climate. Given these trends, the group proposed that Council consider the advisability of eliminating the print version of *The Journal* and to consider the impact of print elimination on library subscriptions because university libraries are the main source of revenue for *The Journal* through subscriptions.

During the past year the working group discussed addi-

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tional possibilities for reducing the publication costs by increased efficiencies without compromising peer review. Another approach discussed was to publish more papers without increasing the overhead of the peer review process and without decreasing quality. Clearly, these ideas require more thought and discussion that will take place during the next year.

The committee recommended, and Council approved last fall, that the future discussions of SfN's publishing ventures be led by a new eight-member working group that includes members of the publications and finance committees. This publication open access group will identify several broad scenarios for phasing out print and phasing in open access and will develop financial plans for a variety of open access models, including a subscription-based, hybrid subscription plus open access option, and full open access. The working group will be chaired by President-Elect David Van Essen, former editor-in-chief of *The Journal*.

Because the decisions resulting from this process will have high impact on all SfN members, it is important to have an ongoing dialogue with our membership. To this end, the Society has set up a structured discussion forum on its Web site for interested parties to provide input. The online forum may be accessed at http://forums.sfn.org. The Society looks forward to hearing your ideas about its future publishing activities via this discussion forum. ■

# Call to Join AAAS Section on Neuroscience

The American Association for the Advancement of Science (AAAS) is holding its annual meeting Feb. 16–20 in St. Louis. This meeting has a broad representation across scientific disciplines and is attended by hundreds of science journalists. Many SfN members are already members of AAAS and attend the meeting to take advantage of its offerings in neuroscience and other scientific fields of interest to them.

Scientists indicate their area of interest when applying to AAAS by joining a "section." Up to now, the number of AAAS members who have identified themselves as neuroscientists by joining the neuroscience section is relatively small. This negatively impacts the amount of neuroscience programming that AAAS will schedule for the meeting, which represents a missed opportunity for SfN members to advance a broader appreciation of neuroscience by scientists in other fields and representatives of the media who attend the AAAS meeting.

"We would like to see AAAS expand its attention to neuroscience research," says Michael Zigmond, secretary of the AAAS neuroscience section, and former SfN Secretary. He urges SfN members to identify themselves by checking the "neuroscience" box on their AAAS application or renewal form, and notes that AAAS members can join more than one section.

"AAAS, through its annual meeting, presents the chance to increase the prominence of neuroscience across the scientific community," Zigmond says. "It's in our best interest as neuroscientists to take advantage of that."

Thomas Carew, a past SfN Council member and chair-elect of the AAAS neuroscience section, concurs. "The AAAS meeting is an excellent opportunity for SfN members to increase public exposure and awareness of the exciting advances being made in our field."

The meeting will host thousands of scientists and science policy experts, along with educators, students, journalists and others; and feature more than 200 symposia, plenary lectures, topical lectures, seminars, and other sessions. Symposia will focus on topics such as climate change, the threat of bio-terrorism, and the need to identify and nurture young scientists and engineers, as well as the ethics of neuroscience.

"The program this year is designed to challenge us as scientists, engineers, teachers, and citizens to frame important scientific and societal problems in ways that create opportunities to apply the best in science and technology for broad benefit," says AAAS President Gilbert S. Omenn. "We can mobilize individual disciplines and cross-disciplinary work on major national and global goals."

To learn more about the meeting and to register, follow the "Annual Meeting" link from www.aaas.org. Scientists, full-time students, postdoctoral students, and residents who are not AAAS members can become members and enroll in the neuroscience section through the same Web site. ■

# Record Attendance at Neuroscience 2005 in Washington, DC

The Society's 35th Annual Meeting, held Nov. 12–16, 2005 in Washington, DC, was a great success. Nearly 35,000 attended Neuroscience 2005, the largest SfN meeting ever. The gathering was also the largest convention of any kind ever held in Washington, DC.

The Dalai Lama of Tibet gave the first in a new SfN lecture series titled "Dialogues between Neuroscience and Society," and called for scientists to be guided by ethical principles in the use of new knowledge. The "Dialogues" lecture, meant to foster an exchange between the public and the neuroscience community, was added to the meeting's established lineup of lectures, symposia, workshops, socials, and satellite events, as were an improved on-site career fair and a "Meet the Expert" series. An estimated 14,000 people attended the talk in the main hall and overflow rooms.

"This year, we welcomed nearly 35,000 attendees to the annual meeting," said Eve Marder, 2005 chair of the Society's Program Committee. "It was an outstanding opportunity for scientists from around the world to get together and share their ideas. And the new features and activities nicely complemented what has long been an outstanding scientific program."

Highlights of this year's meeting included a public lecture on human brain aging, a presidential symposium on neural circuit and plasticity mechanisms, and the Neurobiology of Disease Workshop, which celebrated its 25th year.

Marilyn S. Albert of Johns Hopkins University gave the public lecture, "The Aging Brain: Predictors of Optimal Function." She described studies that identified lifestyle factors that can predict a person's mental acuity, physical activity, and social involvement during that aging process. Albert spoke about hypotheses derived from animal models that have been proposed as explanations for such lifestyle factors. She also showed an SfN video featuring her mother as an example of healthy brain aging. (A DVD covering the public lecture, presidential symposium, and NDW topics may be obtained by visiting the SfN Web site at www.sfn.org.)

Preceding the lecture, SfN President-Elect Stephen Heinemann presented Colin Blakemore with the SfN Science Educator Award for his "tireless efforts to reach out to all audiences, using every technology . . . to make neuroscience more accessible to the public around the world."

SfN President Carol Barnes also presented renowned pianist Leon Fleisher the SfN Advocacy Award for his work in raising public awareness about dystonia, a form of which he was diagnosed with in 1991. After the lecture, Fleisher delighted attendees with a performance.

The presidential symposium, "From Discoveries in Neural Circuit and Plasticity Mechanisms to Innovative Treatment Strategies," was presented by Mahlon R. DeLong of Emory University, Paula A. Tallal of Rutgers University, and Andrew B. Schwartz of University of Pittsburgh. DeLong spoke about the basis and surgical treatments for Parkinson's, dystonia, and other movement disorders; Tallal talked about intervention for learning and language problems; and Schwartz discussed approaches for developing neural prosthetics for spinal cord impaired patients.

The Neurobiology of Disease Workshop (NDW) focused on autism. In a full day of workshops, speakers used live presentations and patient videos to show basic scientists the range and early manifestations of autism spectrum disorders. Experts then discussed the neuropathology and abnormalities in brain growth and functional networks. The final session considered the challenges of creating animal models of this uniquely human behavioral condition. After lunch, participants regrouped into smaller discussion groups in which they actively explored current and future research strategies. Autism and neuroscience investigators joined these discussions, adding a range of experience and perspective to a highly successful course.

On Monday evening, a special reunion celebration and program honored 25 successful years of the NDW. Past faculty, organizers, and attendees gathered to celebrate the many accomplishments and advances that have resulted from their work, and Ed Kravitz, the founder and initial catalyst behind the NDW model, was honored for his contributions. Also on Monday and Tuesday, nine embassies in Washington hosted events to showcase their nations' neuroscience research and promote international collaboration. Participating embassies included Germany,

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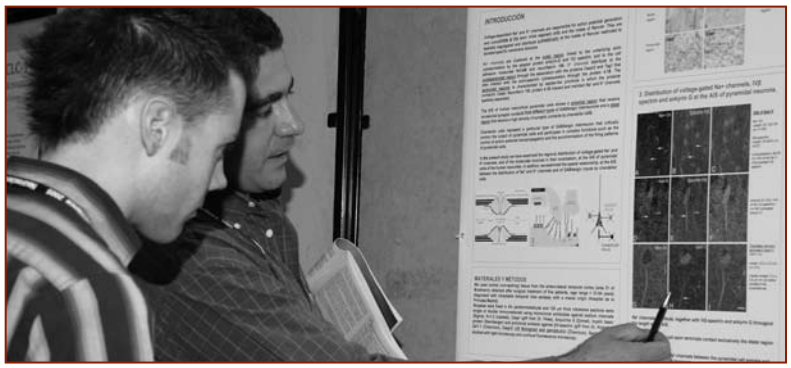
## SCIENCE/RESEARCH

Proving once again to be the premier site for neuroscientists to exchange their latest findings, Neuroscience 2005 featured a record-breaking 16,720 abstracts covering topics ranging from neuropathic pain to breakthroughs in autism research. SfN President Carol Barnes (top) stands with the Dalai Lama at the inaugural "Dialogues between Neuroscience and Society" lecture, which attracted 14,000 attendees. Edward G. Jones (below) presents the History of Neuroscience Lecture entitled "Adventures in Neuroanatomy." Between lectures and events, almost 35,000 attendees browsed the poster floor.

## PROFESSIONAL DEVELOPMENT/SOCIALS

SfN's commitment to professional development and continuing education was stronger than ever. In addition to CME credit availability, the Society introduced a new career center, NeuroJobs. Short Courses and workshops like the Neurobiology of Disease Workshop provided opportunities for professional development. Kenneth S. Kosik (top left) presented "Micro RNA Expression Patterns in the Brain." Catherine Lord (top right) spoke about her autism research, this year's NDW topic. Soo-Siang Lim (bottom left) spoke at the NSF Funding Opportunities Workshop. Social events, like Alzheimer's Researchers Karaoke Night (bottom right), provided a chance to meet and socialize.


# 2005 EVENTS



## ADVOCACY

Informing lawmakers about the importance of scientific research is a cornerstone of the Society for Neuroscience. At Neuroscience 2005, the Public Advocacy Forum demonstrated ways that researchers can reach out to legislators, which featured Kathie Olsen, deputy director of the National Science Foundation (top). The Animal Research Panel (bottom left) addressed the challenges in research with nonhuman primates. The embassies of nine countries sponsored events showcasing their nations' neuroscience research. Science Educator Award winner Colin Blakemore (bottom right) spoke at the Embassy of the United Kingdom.


## EDUCATION

Both students and teachers took away a greater understanding of the brain and nervous system at Neuroscience 2005. Nobel Laureate Eric Kandel joined SfN President Carol Barnes to present "Brain Awareness Week – The Next Decade," which included a meeting to explore the responsibility of scientists as public educators and was followed by a poster session (top left) and networking reception. At the Building Neuroscientist-Teacher Partnerships workshop hosted by NIH (bottom left), attendees, shared ideas on how to forge more effective partnerships between researchers and K-12 teachers, students, and schools.

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Great Britain, Canada, Hungary, Italy, Russia, Australia, Norway, and New Zealand.

The nine events featured a wide range of topics. The Canadian Embassy sponsored an event titled "The Journey Inside." The evening's primary speakers were Michael Meaney of McGill University in Montreal and Dave Williams an astronaut with the Canadian Space Agency. The Embassy of Hungary event included discussions on various subjects — from key players in oxidative stress and brain neuropeptides to the endocannabinoid system and synaptic events in the cerebral cortex. Several prominent figures in Italian neuroscience, including Gaetano di Chiara, President of the Società Italiana di Neuroscienze, conveyed key messages to an audience of about 300 people, including the importance of keeping Italian researchers in Italy to avoid "brain drain," the need for increased private funding for scientific research, and the benefits of creating large, central neuroscience research institutions. The German Embassy program was highlighted by Hannah Monyer, Medical Director of the Department of Clinical Neurobiology, University Hospital of Neurology, Heidelberg. Monyer discussed "Inhibition in the brain — its role for cognitive processes." On the following day, approximately 150 people attended the New Zealand event which included three presentations. Matthew During, of the University of Auckland, discussed his genetic vaccine approach for protection against neural damage induced by epilepsy and stroke. Mike Dragunow, also from the University of Auckland, outlined his research into neurodegeneration and signal transduction using cell line models of the nervous system and post-mortem adult human brain material. Lastly, Cliff Abraham spoke about his work into the cellular and biochemical changes that underpin long-term memory.

The most widely attended of the meeting's events, watched by a crowd of approximately 14,000, was the Dalai Lama's lecture, "The Neuroscience of Meditation." The Dalai Lama talked about the commonalities between eastern contemplative practices and contemporary science, about areas of fruitful engagement between the two disciplines, and about the importance of recognizing the relationship between ethics and science.

It was the first in a series of talks, "Dialogues between Neuroscience and Society." Next year's "Dialogues" speaker will be architect Frank Gehry, who is expected to talk about human perception and how it relates to his architectural vision.

The meeting's on-site career fair gave meeting attendees the opportunity to access job listings and schedule interviews with employers through NeuroJobs, SfN's online career center. Applicants and employers met in a casual environment provided by private interviewing booths.

In Saturday's new "Meet the Expert" series of workshops, experts detailed their techniques and accomplishments to student scientists and postdoctoral researchers. Each 90-minute session featured an informal and informative dialogue over breakfast between expert and audience.

Like these new features, the meeting's normal lineup of lectures and roundtables was well received. Thomas H. Murray of the Hastings Center gave the David Kopf Memorial Lecture on Neuroethics. He addressed the ethics of cognitive enhancement by contrasting likely scenarios in the field with the use of performance-enhancing drugs in sport. Solomon H. Snyder of Johns Hopkins University gave the Albert and Ellen Grass Lecture on "Messengers of Life and Death." He discussed the role of neurotransmitters, second, and third messengers in cell death and cytoprotective actions.

Stephanie J. Bird, former chair of the Society's Social Issues Committee, moderated a roundtable on the use of stem cells in neuroscience research. Marie Csete of Emory University, Fred H. Gage of the Salk Institute, Mahendra Rao of the National Institute on Aging, Patrick Taylor of Children's Hospital Boston, and William Hurlbut of Stanford University and the President's Council on Bioethics addressed the ethical, legal, and policy implications of this hot-button issue, and offered advice on discussing it with journalists and the public.

Finally, Stuart Zola, head of the Yerkes National Primate Research Center, moderated the Animals in Research Panel that addressed the obstacles facing those who will conduct research on non-human primates in the coming decade, including logistical and animal care considerations. Speakers James Herndon, Jon VandeBerg, and Jeff Rogers discussed the role of the primate centers, primate genomics, the role of chimpanzees in aging research, and the future of primate research. ■

# New Software to Streamline Abstract and Itinerary Process

Beginning in 2006, the Society for Neuroscience will use the Online Abstract Submission and Invitation System (OASIS) developed by Coe-Truman Technologies to facilitate the abstract submission and itinerary planning processes for the annual meeting. This new system will incorporate advanced software technologies and approaches, and should make these processes easier for meeting presenters and attendees alike.

After an extensive 16-month evaluation process, SfN staff and committee members selected OASIS from among three competing software products. "We solicited feedback from members about the abstract submission and itinerary planning experience," says Rudolph Tanzi, Chair of SfN's Program Committee. "Based on that feedback, we chose the product that would best serve them. And I believe members will be very satisfied with OASIS."

Coe-Truman Technologies is a 22-year-old information and technology company based in Chicago, Ill., that provides software and services to associations, manufacturers, distributors, and other organizations. Coe-Truman considers OASIS "the industry leader in abstract processing for scientific, medical, and professional associations." More than 100 other societies use OASIS, including major groups such as ARVO, Alzheimer's Association, American Heart Association, Biophysical Society, and many others.

With OASIS, users can create "research groups" of linked abstracts during the submission process. This feature allows submitters to request that the Program Committee schedule their abstract in the same session as related poster or slide presentations. Barring unavoidable scheduling conflicts, this new feature should improve submitters' ability to identify and alert the Program Committee to colleagues whose research interests complement their own.

Another new feature will allow submitters to view and print their abstracts even after the abstract submission period is over. This improvement also will allow submitters to access and print submission receipts instead of going through the slower process of requesting such printouts from the SfN central office.

Additionally, submitters will be able to check the scheduling status of their abstracts before the launch of the itinerary planner.

The new abstract viewer/itinerary planner also will be improved. Simpler, more user-friendly interfaces will better accommodate non-Windows platforms, such as Linux and Mac. Search features will function more smoothly and intuitively and will incorporate helpful browsing options.

*After an extensive 16-month evaluation process, SfN staff and committee members selected OASIS, developed by Coe-Truman, from among three competing software products.*

When attendees download the new abstract viewer/itinerary planner to their personal computer, they will always be downloading an up-to-the-minute version of the software. The new system will allow attendees to "sync" the downloaded software to the Web, essentially telling the software to periodically check the Web for scheduling changes and update attendees' itineraries accordingly.

In addition to these noticeable changes, users of the software will benefit from some of the behind-the-scenes improvements that OASIS will provide. For example, the system will improve SfN's ability to oversee data cataloguing and collating, resulting in faster, streamlined transitions between steps in the abstract scheduling process. ■

# LHHS Appropriations Bill Passes for Fiscal Year 2006

On Dec. 21, 2005, Congress approved the Labor, Health and Human Services, Education (LHHS) Appropriations Bill, providing funding for the National Institutes of Health (NIH) for FY2006. At press time, the bill was on its way to the President for signature. The appropriations bill provides a .05 percent increase, but a one percent across-the-board cut means that NIH actually will receive less than in FY2005.

In order to keep the federal government in operation, Congress passed a Continuing Resolution, keeping programs running at the FY2005 levels. Clearly, it was disadvantageous for funding to continue for an extended period of time at last year's level, as this has caused NIH administrators to withhold partial funding from renewal grants and delay awarding new grants until the fiscal situation is settled.

When the new fiscal year began Oct. 1, 2005, the LHHS bill was not complete. Several obstacles delayed the passage of the bill, including the ongoing lack of agreement between the House and Senate, and even among House members themselves. After Senate and House leaders tried to iron out the differences in their respective bills in Conference Committee, the House rejected the proposal by a vote of 209–224. That version of the legislation cut or eliminated many important health and education programs.

Under the defeated bill, the NIH would have received its smallest increase in more than three decades — an increase of only $250 million, or less than one percent above the FY2005 level. The bill would have also trimmed $1.4 billion from last year's comparable operating levels, including a nearly $1 billion cut for Health and Human Services (HHS) programs. Those HHS reductions included $249 million in funding cuts for the Centers for Disease Control and Prevention, and the elimination of several programs to improve health care access and health professional training.

The bill was thwarted by unified Democrats, most of whom wanted more spending on social programs, and 22 Republicans, some of whom may have otherwise supported the bill but were upset that projects for lawmakers' districts (known as earmarks) ranging from schools and hospitals to programs, were removed from the legislation. Had the earmarks been included, even more draconian cuts would have been necessary to keep the legislation within its overall spending limits. As it was, in addition to the health cuts, education funding would have also declined for the first time in ten years. Pell Grants would have been frozen for the fourth consecutive year. Funding for the Low-Income Home Energy Assistance Program, which subsidizes heating bills, would have received no funding increase in spite of expected higher costs for heating oil and natural gas.

The bill was reported out of the Conference Committee for a second time to the House of Representatives on Dec. 13. The second version of the Conference Report added just enough funding for rural health care and training programs to cause the House to approve it by a vote of 215–213. From there, the bill went to the Senate where it was also approved as an add-on to the Department of Defense Appropriations Bill. If all of this news were not bad enough, the final version of the bill also included a government-wide one percent across-the-board cut for all domestic discretionary spending. The net effect on NIH will be a final FY2006 allocation that is less than FY2005.

SfN and other scientific organizations had consistently supported the higher Senate-approved funding level of $29.4 billion for NIH, as opposed to the final funding level of $28.5 billion. The health research advocacy community has argued that health programs should be a funding priority and that efforts should be made to produce actual funding increases over last year's FY2005 program funding levels. SfN also opposed any across-the-board cuts that would result in under-funded public health programs. This was an ambitious funding agenda, but necessary to maintain pace with biomedical research inflation, which currently stands at 3.5 percent.

The final spending bill reflects the difficulty of addressing important health research, social, and educational programs at a time when Congress is more interested in cutting taxes, funding the war in Iraq, and is pressured to fund hurricane relief. The health research advocacy community's hope is that by recasting the debate and redoubling its efforts, funding levels for FY2007 will increase. Please check future issues of *Neuroscience Nexus* for the latest updates on NIH funding. ■

# Engaging Educators and Their Students in Neuroscience


Judy L. Cameron

*Judy L. Cameron is a Professor of Psychiatry at the University of Pittsburgh, a Professor of Behavioral Neuroscience at Oregon Health and Science University, and a Senior Scientist at the Oregon National Primate Research Center. She is a former member of the SfN Committee on Animals in Research.*

***NQ:* Could you briefly summarize your recent keynote talk at the National Association of Biology Teachers convention? What messages did you emphasize for teachers?**

**Cameron:** My talk focused on how exercise affects brain function. I spoke about my studies on monkeys, which were performed in collaboration with William Greenough at the University of Illinois at Urbana-Champaign and Nancy Williams at Pennsylvania State University.

We exercised monkeys using a training regimen that could easily be undertaken by most people. This moderate level of exercise led to increased alertness and attentiveness. Monkeys learned to use cognitive testing apparatus twice as fast if they were exercising than if they were sedentary. At the end of five months, we found that exercised animals had significantly more neurogenesis (production of new neurons) in the hippocampus and gliogenesis (production of new glial cells) in the hippocampus and motor cortex, and we found there was a greater vascular volume in the motor cortex. We are now examining additional areas of the brain.

Further studies in monkeys using noninvasive activity monitors mounted on a collar worn by each monkey indicated that some animals are very sedentary day after day and others are very active day after day. I showed that a monkey's activity level does not depend on its housing situation (with or without other monkeys, with or without toys and with lots of room to move around), and that active monkeys are significantly less likely to gain weight on a high calorie, highly palatable diet compared to sedentary monkeys.

After talking about these studies, I concluded that there are a number of reasons that teachers would care that students are getting some exercise on a regular basis. I also made a pitch that, because this was a topic that students would be very interested in, it would be a good way to teach some general information about the brain.

I ended the session by showing results of having my students wear activity monitors on a belt around their waists for a week and having them perform activities such as walking, running, stair-climbing, sleeping, watching TV, and working on the computer. I showed that watching TV and working on the computer were generally very sedentary activities. At times, students would actually be less active when watching TV or working on the computer than when they were sleeping.

***NQ:* As a scientist and educator, why is it important for high school students to have an understanding of current scientific work in neuroscience?**

**Cameron:** Students are intrinsically interested in how the brain works. Because neuroscience is a rapidly progressing science, we should capitalize on that interest to attract the attention of very bright young people. Students entering college are deciding on majors earlier and earlier. To attract them to our field we must introduce them to neuroscience in high school. Also, better education of all students about neuroscience provides for a more knowledgeable general public in the future.

***NQ:* How can working scientists help teachers engage students in neuroscience? How can SfN play a role?**

**Cameron:** The best way to engage students in neuroscience is to show them new and interesting findings. Explaining how critical questions came to be asked, and how one finding builds on another, engages students in the scientific process. Some of the best people to do this — teach neuroscience, teach the scientific method, and transmit the excitement about neuroscience — are working neuroscientists. Also, this is a rapidly changing field and often some of the most exciting work is not available in textbooks.

SfN could help facilitate interactions between neuroscientists and students and teachers by providing handout material that can easily be used as a resource. The *Brain Facts* publication is very popular in this regard. SfN can

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promote the idea that even though scientists have many demands on their time — including research, writing grants, training graduate and medical students, giving talks, etc. — they can also play an important role in early education. It is well worth their extra effort to spend time with younger students. SfN also can help by providing tips for public speaking about science, and by providing materials and advice to help scientists think through questions students may ask about experimental animal research.

***NQ:* Can you give an example of a neuroscience concept that could be integrated into middle school or high school activities?**

**Cameron:** The work I talked about at the National Association of Biology Teachers meeting, the effects of exercise on the brain, is a wonderful topic for engaging students. First, it is a topic that most people can easily relate to. Kids generally know what exercise is, they know it has health benefits, and they know various ways they can exercise. You can engage the students by getting them to think about ways you may study exercise, things you would need to control when running an exercise experiment, and how physiological responses to exercise may affect the brain. When kids already have some basic information, they can help think through how to design an experiment with you. The more students think with you, the more engaged they are, and the more likely they are to retain the information you are providing them.

Second, the effects of exercise on the brain are "new" — that is, you are speaking about a familiar topic but providing a new twist. Many students will know exercise is good for muscles and good for the heart, but very few will know that exercise can stimulate alertness and be neuroprotective.

Third, students learn something they can apply. If exercise is good for your brain, then a reasonable take-home message is that you should exercise whenever possible. Kids can spread the word about exercise at home and to friends. We know that when you teach a topic, you learn it even better — so this serves to get new information to the public, but also helps the students learn better. In the best of all worlds, as students are talking about this information to others, they will think of new questions about this topic they would like to learn about.

***NQ:* What is the most surprising thing you have learned from your work with teachers and other non-scientist audiences?**

**Cameron:** The most surprising thing about talking to teachers, students, and other nonscientific audiences for me has been that the audience is generally very hungry for new scientific information. They are fascinated by talking to a "real" scientist and learning a bit about how scientists think. Years ago, I thought that many people would find science to be dry and boring. However, my experience has uniformly been that virtually all people are or can become interested in scientific information. They become interested if you make the information relevant to their everyday lives, and if you convey it in such a way that they can readily transmit it to others.

There are two key aspects to transmitting your message this way. First, use language that is readily understandable to the average person. If you must use new technical terms, define them. My daughter was my best teacher in this regard. When she was in fourth grade I invited her and several of her friends to come to a series of classroom lectures with me and critique my performance — and wow, were these kids critical! They would make lists of words I should not use, they would think up alternative ways for me to explain a concept so kids would be more likely to "get it;" they would tell me what was "boring;" and they would come up with suggestions for how to get kids involved in my lectures.

This last point now constitutes my second key piece of advice: Have a discussion with an audience instead of lecturing to them! The more you can get the audience to think with you about what questions are interesting to ask — what are good hypotheses, how you might test the hypothesis, what you will need to control for, how you would collect the data, and how you would interpret the data — the more they will get out of your discussion and the more likely they are to retain the information.

***NQ:* Many scientific issues, specifically stem cell research, became politicized recently and talked about extensively in mainstream media. What is the best way for scientists to communicate with teachers and to assist them in accurately addressing these issues?**

**Cameron:** I think one-on-one help from scientists is very important, particularly when a scientific issue has become highly publicized or politicized. Teachers want to be able to discuss these issues with their students because their students are already interested. I start by talking to the teacher about why the research was performed. It's basically an outlining of the scientific method that we use in approaching a question. What were the scientists trying to do, and why were they trying to do it? Often, these key issues are lost when there is a lot of publicity. I follow this up with clear facts about what was actually done. I think you need to differentiate what was concluded from what was actually done. Often, this last point is where controversy comes in; one party may make one conclusion but another party may make another conclusion. Laying out the information in this way allows the teacher to walk students through the same path: what was trying to be done, what was done, what was concluded. Then, the teacher has a good basis upon which to launch a class discussion of how you identify what is valid science, ethics surrounding science, what may be done next, whether regulations are needed to govern next steps, and the pros and cons of regulations.

***NQ:* Your work relies heavily on the use of primates. Given the advances in research techniques, why is animal research still necessary in the 21st century?**

**Cameron:** The advances in research techniques allow us to obtain higher quality data, and we can now delve deeper into the details of brain structure, function, and pathology. But these advances don't negate the advantages of animal research. Animal research allows us to perform controlled experiments, to determine cause and effect in a manner that's impossible in appropriately non-invasive observations of humans. To understand a biological system as complex as the brain, we have to manipulate and even disrupt its function in a controlled fashion with appropriate experimental design. For example, if we know that a given mutation can cause a certain disease in humans, we can recreate that mutation and study the effects of it in a mouse, where the only thing we have manipulated is the gene. Drugs can be developed and tested that specifically test the impact of that mutation. This isn't possible in humans. It's also now possible to turn genes on and off temporarily in animal models and study the impact on brain structure and function to provide clues to mechanisms of disease. Clearly, this isn't feasible in humans. In addition, while there has been great improvement in the last decade for techniques that allow us to look at the human brain in relatively non-invasive ways, these techniques are generally not able to look at the cellular and subcellular levels. It's becoming clear that key aspects of neural function are governed at the cellular and subcellular levels, making the animal model that much more important.

It's often necessary to record from neurons or block their activity to determine their function or model their dysfunction, which cannot be done in humans. Finally, one occasionally hears that computer models of brain systems should be used to investigate experimental outcomes rather than real experiments, but advocates of such an approach vastly overrate our knowledge of the details of neuronal structure, function, and brain circuitry. We possess only a tiny fraction of the information necessary to develop such computerized experiments. The key is to do the highest quality animal experiments possible and generate the most accurate and informative measurements that will increase our basic knowledge, but we're still a long way from being able to do this with computers.

***NQ:* What do you think is the number one misconception that non-scientists have about animal research?**

**Cameron:** I think the number one misconception about animal research is that scientists can do *any* experiment that they think of with animals. The big news for most groups that I talk to is that animal experimentation is closely monitored and regulated. I often talk about the rules that govern animal use, such as prevention of unnecessary pain and discomfort, adequate housing with detailed size regulations, appropriate diet, and providing

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for psychological well-being. I explain that each research institution has an Institutional Animal Care and Use Committee (IACUC) made up of veterinarians and scientists. At least one member of the public is on this committee and they review every protocol that is performed. I explain that the IACUC asks questions for clarification and the investigator must provide acceptable answers to all questions before they undertake an experiment. I also discuss the fact that the IACUC, NIH, and United States Department of Agriculture visit all facilities regularly to ensure that all rules are being adhered to. But probably the most effective strategy I use to increase public comfort with animal experimentation is to explain that one of the main reasons our lab uses animals is because it is generally not possible for people to control stresses in their lives, and that the effects of stress cloud our understanding of what we are trying to study.

***NQ:* Why is it important for teachers, students and the public to understand the need for the responsible use of animals in biomedical research?**

**Cameron:** I think that people are more receptive to the findings of biomedical research if they feel comfortable with the ways animals used in research studies are treated. And people learn more about how ideas can be reasonably tested in scientific studies if they understand the principles of responsible use of animals. This allows them to really learn the scientific method, and how to think through the design, performance, and interpretation of scientific findings. Further, making the next generation of bright young scholars feel comfortable with how animals are used in biomedical research is important if we are to spark their interest in biomedical research.

***NQ:* Share some successful strategies or activities that have made the public aware of the importance of animal research.**

**Cameron:** The general strategy that I use is to make people attending my lectures understand the research question we are trying to answer and then have them think through how they might perform experiments. This strategy works well for the research our laboratory does, as we are generally interested in questions that can at least be answered in part by studying physiological processes. In these discussions I encourage participants to think about how they might design an experiment, what factors they would need to control for, and in general how they would make measurements. I often bring up questions regarding whether stresses need to be controlled. We discuss how you would choose an appropriate experimental system to work with, and, if we choose animals, discuss issues arising from that choice.

***NQ:* What has changed most about neuroscience research since you entered the field?**

**Cameron:** I think the biggest difference is how broad the scope of the research has become. For the type of research that my lab undertakes — studying the effects of everyday life stresses on neural function — answering any question now requires working at many different levels. And, because work at each level has become so sophisticated, it is best to work in collaborative, interactive teams of experts. The days of being able to tackle all aspects of a question with your own expertise are pretty much gone.

For example, in our studies examining the effects of exercise on brain function, we set out to address the basic question of whether the findings in rodent studies showing that rats and mice given access to a running wheel show changes in neural plasticity could apply when the level of exercise undertaken was similar to what an average human would participate in. We wanted to look in some detail at the brain. And we wanted to use an animal model, and to test cognitive brain functions pertinent to humans. So we chose a primate model. Our first challenge was to design an exercise program similar to what would routinely be prescribed in clinical studies. I am not an expert in exercise physiology, so we collaborated with Nancy Williams at Pennsylvania State University Noll Laboratory for Exercise Physiology. Williams has experience studying the physiological effects of exercise in both humans and monkeys and could design an appropriate exercise program. My lab does have considerable expertise in performing in vivo studies with monkeys and we were able to train monkeys to exercise and make all of the physiological measures with confidence. However, we also wanted to test effects of exercise on cognitive function and we had not made such measures previously. Thus, we collaborated with Jocelyn Bachevalier at Emory

University, who has considerable experience performing cognitive tests with nonhuman primates, to design appropriate tests. Lastly, we wanted to determine if this level of exercise could lead to plastic changes in blood flow to the brain and in the production of new brain cells. To do a good job of answering this question we collaborated with William Greenough, who has considerable expertise quantifying such morphological changes in the brain of both rodents and primates. Thus, this research effort required a team of four scientists with significantly different areas of expertise, located in four institutions across the country. Neuroscience done this way requires a scientist to have a strong appreciation for diverse areas of study, very good communication skills, and the willingness to spend considerable effort coordinating a research project.

***NQ:* How would you advise a neuroscientist to go about the task of contributing to the public's understanding of the work we do?**

**Cameron:** I think the most valuable public contribution that neuroscientists can make is sharing with the public their enthusiasm for knowledge about how the brain works. I would encourage all members of the Society to spend a little bit of time each year talking to the public about what they do, why they do it, and how it is helping society. ■

## 2006 FENS Forum to be Held in Vienna, Austria

Members of the Society for Neuroscience are encouraged to attend the fifth Federation of European Neuroscience Societies (FENS) Forum of European Neuroscience in Vienna, Austria, July 8–12, 2006. The largest neuroscience meeting in Europe, the FENS Forum has been held every two years since 1998.

For more information, please visit the Forum's Web site http://fens2006.neurosciences.asso.fr. Also, SfN is offering special travel awards to support the participation of American, Canadian, and Mexican graduate students. Travel awards of $1,500 will be distributed on a competitive basis to honor outstanding graduate students nominated by their local chapter. To apply for a travel award or to get further information, visit www.sfn.org/chapters. ■

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