

NEUROSCIENCE

SUMMER 2011

Q U A R T E R L Y

*“The promise in
[neuroscience] is unlimited,
and the need for further
research is immediate...”*

— U.S. Vice President Joe Biden

IN THIS ISSUE

SfN Announces 2011 Election Results.....	1
Neuroscience at Center Stage During One Mind for Research Forum	1
Message from the President	2
Q&A: Lord Sainsbury & Fred Kavli: Investing in Neuroscience Research and Public Education	4
Inside Science: Links Between Obesity and Addiction.....	6
Advocacy Update.....	9
Spotlighting Current Trends in Neuroscience Education.....	10
Promoting Brain Awareness: A Year-Round Event	12
Council Round-Up: Spring 2011 Meeting.....	13
Neuroscience 2011	14



SfN Announces 2011 Election Results

The Society congratulates its newly elected officers and councilors. Chosen by members through an independent online monitoring company, the incoming Council members begin their terms at Neuroscience 2011 in Washington, DC.

The membership elected Larry Swanson, University of Southern California, as the incoming president-elect and Brenda Claiborne, University of New Mexico, as the incoming treasurer-elect. The elected incoming councilors are Li-Huei Tsai, Massachusetts Institute of Technology, and Michael Greenberg, Harvard Medical School.

OFFICERS

Larry Swanson, incoming president-elect, is professor of Psychology and Neurology, as well as the Milo Don and Lucille Appleman Professor of Biological Sciences, at the University of Southern California. He has been a member of SfN for 40 years and his involvement has included serving as an SfN Council Secretary, associate editor of *The Journal of Neuroscience*, and a member of the Finance and Scientific Publications Committees. His research focuses on the cellular localization of neurotransmitter systems within neural networks that control motivated and emotional behavior, and how expression of these neurotransmitter systems is modulated by steroid hormones.

Continued on page 15...

Neuroscience at Center Stage During “One Mind for Research” Forum

Cutting-edge neuroscience was presented at a conference May 23–25 that brought together leading neuroscience researchers, patient advocates, NIH directors, members of Congress, business leaders, returning U.S. soldiers, and even Vice President Joe Biden. The event was the first “One Mind for Research” Forum held in Boston.

The One Mind for Research effort, sparked and led by former Congressman Patrick Kennedy and businessman Garen Staglin, a longtime advocate for mental health, is urging a national and united emphasis on brain research. The goal is to speed understanding of brain function and treatments for brain diseases and disorders, with an early emphasis on soldiers affected by today’s “signature wounds of war”: traumatic brain injury and post-traumatic stress disorder. SfN leaders helped shape the array of scientific discussion — including genetics, the connectome, the neurobiology of war, emotion and motivation, and learning and memory — and a companion 10-year plan for progress.

Given Kennedy’s passion for brain research and his family’s history of public service, the forum was organized to coincide with the 50th anniversary of President John F. Kennedy’s call in 1961 for America to rally its scientific know-how to put a man on the moon, with Kennedy modernizing the call to rally for brain research.

Continued on page 8...

Message from the President

Thinking Differently: The Value of an Individual Perspective



Susan Amara,
SfN President

Collectively, neuroscientists have made remarkable discoveries about the brain. We have learned about the brain's infinite complexity: its diverse signaling pathways, complex connections, adaptive responses and the intimate link between genes and the environment. More than any other discipline I can think of, continued forward progress in neuroscience depends on the unique visions

of scientists from different backgrounds and perspectives.

The power of individual approaches — our unique questions, passions, and backgrounds — are essential to what we do. The scientific process itself is ordered and structured, but the curiosity that drives each of us to dig deeper in our search for answers is all our own. No matter how crowded a field may be, an individual can always see it in a new light or from a different angle. All it takes for the field to be set in a new direction is noticing something no else has.

NEW AVENUES INSPIRED BY INDIVIDUAL PASSIONS

The SfN annual meeting is an embodiment of the field's rich diversity. It offers testament to the creativity and ingenuity in neuroscience, presenting a plethora of questions and opportunities to discuss and debate possible solutions with colleagues from around the globe. This keeps the meeting fresh and exciting, and compels so many of us to attend each year.

This year's 2011 Presidential Special Lectures celebrate the distinctive views and approaches of several extraordinary scientists. Each lecturer comes from a different background — anatomy, physiology, molecular biology, genetics — and each brings a unique vision to their science. They serve as models for our younger investigators and exemplify the aspirations of the field by demonstrating a personal engagement and passion for their work while preserving their curiosity and fearlessness through challenges and long careers. They share what all scientists strive to maintain — a fascination with innovative science.

The series begins with Cornelia I. Bargmann, who will discuss how genes and the environment interact to generate flexible behaviors. Her passion and unique vision are self-evident, as she uses a genetic model system to establish

basic principles that enable her to link her discoveries to the broader view of how neurons, circuits and activity drive complex behaviors.

Next is Mu-ming Poo, whose imaginative work on neural plasticity reflects his strong training in biophysics, cell biology, and development. He is a prime example of a researcher who notices things that others might miss. His background in physics and biophysics has helped him to clarify how neurons coordinate their firing patterns and undergo adaptive changes that regulate axonal and dendritic growth, synapse formation and development.

Ann M. Graybiel, will then consider how activity states in the forebrain are controlled and shaped during decision making and adaptive behavior, and how these processes may go awry in motor and psychiatric diseases. In my view, Ann brings a personal fearlessness to her deep and elegant work on the basal ganglia, using a wide array of approaches that span from molecular genetics to multi-electrode recording in awake behaving animals.

To cap off the series, Andrew P. Feinberg embraces new conceptual and technical approaches in his view of the epigenetic mechanisms that operate on a large scale to regulate the function of our genomes. His developments allow for an advanced focus on the epigenetic basis of disease, including cancer, autism, and psychiatric illness.

By listening to these superb scientists, by attending other lectures and symposia and by simply roaming the poster floor, it's my hope you will get a sense of the greatness of our science and the joy found by those who follow their individual instincts and interests.

BRINGING YOUR UNIQUE PERSPECTIVE TO THE FIELD

In selecting these speakers for the Presidential Lecture series, I also hope to send a message to the next generation of scientists, urging you all to find, foster, and bring your unique perspective to a question at hand. Indeed, often the real contributions to science are made when an investigator sees — and follows — an experimental result they didn't expect. The willingness to pursue unexpected observations and to challenge old ideas is at the essence of what we do. It has opened new areas of exploration and has been deeply sustaining and energizing even, and perhaps especially, during the inevitably difficult times in any scientific trajectory.

Each of us has the opportunity to pursue our unique curiosities, think differently about the problems in front of us, or be willing to adopt new technologies to address challenges. These traits can be a result of individual creativity or formal multidisciplinary training; I tend to find they are also the product of people letting their drive and fascination shape their work as it matures and changes.

Scientists are also enriched by working shoulder to shoulder with those who have different formal training. In fact, I always encourage my students to be an expert in something that I am not. Overall, neuroscience is increasingly recognized as a field where computer scientists and biologists, physicists, engineers and chemists sit side by side. By doing so, we can approach a problem from multiple angles and in distinct ways. In a field ripe with competition, young scientists can set themselves apart by bringing unique knowledge as well as unique perspectives.

PUBLIC AWARENESS OF INNOVATION

The innovation and opportunity in neuroscience was also brought home to me during Congressman Patrick Kennedy's One Mind Research Forum (see article, page 8), which has

begun to bring together some of the nation's finest scientific leaders as well as policymakers, business leaders, advocates, and others, in support of brain research. At the Forum, I was inspired seeing many of our colleagues acknowledge the importance of curiosity-driven research to both basic and clinically-relevant discoveries. In addition to voicing support for the field, Kennedy urged us to break down "silos" where we find them in brain research — whether we are considering how we solve problems, how we train the next generation, or how we coordinate our work across universities, institutes and industries — innovation flourishes where there is diversity in experience, intellectual background, and perspective.

The upcoming annual meeting Neuroscience 2011 and the One Mind Forum are reminders of the relevance of what we do, and the value of sharing our efforts in science with each other and the public. We do research because we love it — it motivates us, it animates us, and, it can spark the passion to pursue unexpected findings. It is my hope you will come to Washington for Neuroscience 2011 to take in an amazing array of research and the possibilities it holds for new insights and applications. ■




➔ Visit the NEW online career center!

NeuroJobs is re-launching with a new look and enhanced features to help you find jobs and manage your career. SfN members enjoy premium services that include resume posting and job alert e-mail notices. For your next job search, visit www.sfn.org/neurojobs.



Lord Sainsbury & Fred Kavli: Investing in Neuroscience Research and Public Education



Lord Sainsbury,
Gatsby Charitable
Foundation Settlor

*Lord Sainsbury was Finance Director of J. Sainsbury plc from 1973 to 1990, Deputy Chairman from 1988 to 1992, and Chairman from 1992 to 1998. He became Lord Sainsbury of Turville in October 1997 and was appointed Minister of Science and Innovation from July 1998 until November 2006. In 2007 he produced *The Race To The Top*, a review of the government's science and innovation policies. He is the Settlor of the Gatsby Charitable Foundation.*



Fred Kavli, The Kavli
Foundation founder
and chairman

Fred Kavli is the founder and chairman of The Kavli Foundation, which is dedicated to advancing science for the benefit of humanity, promoting public understanding of scientific research, and supporting scientists and their work. The Foundation's mission has been implemented through an international program of research institutes in astrophysics, nanoscience, neuroscience and theoretical physics, and through the support of conferences, symposia, endowed professorships, journalism workshops and

other programs and activities. The Foundation is also a founding partner of the Kavli Prizes.

NQ: Tell us about your foundation's interests in neuroscience and what you hope to accomplish by focusing resources in this field.

Lord Sainsbury: My personal interest in neuroscience started when, as an undergraduate at Cambridge University, I switched from reading history to reading psychology and this brought me in contact with brilliant researchers like Horace Barlow and the late Richard Gregory, and led to a lifelong interest in the subject. Then, about 15 or so years ago, Roger Freedman, a great friend from my Cambridge days, told me of the exciting developments beginning to take place in neuroscience, and set up for my Charitable Foundation the Gatsby Computational Neuroscience Unit at University College London, which has become one of the world's leading centers for theoretical neuroscience. Today, I believe that technological developments mean that there is an opportunity to do exciting research on neural circuits and behavior, and I have set up a joint project with the Wellcome Trust to do research in this area.

Fred Kavli: Neuroscience has long fascinated me — it's the most complex part of nature. The brain is the source of who we are and our very sense of consciousness and self. And now

with the human genome and a combination of cutting-edge genetic methods and brain imaging techniques, lab scientists are exploring the neural circuitry of living animals in ways that 20 years ago we could barely have dreamed of.

Nothing exemplifies my interest in neuroscience better than the Kavli Institutes, which are dedicated to understanding and unraveling the complexities of the brain. There are four Kavli neuroscience institutes. At the Kavli Institute for Brain Science at Columbia University, Eric Kandel, Tom Jessell, Rafa Yuste, and others are using advanced imaging technology to observe neurons, synapses, and neural circuits as they develop and function, and as they respond to learning. At the University of California, San Diego, we have the Kavli Institute for the Brain and Mind, which is uncovering the physical and biochemical processes that underlie everything from learning and consciousness to memory and emotions. At the Kavli Institute for Neuroscience at Yale University, they are finding out how the nerve cells and synaptic circuits of the cerebral cortex enable humans to learn about the outside world and to remember what they already have learned. And at the Kavli Institute for Systems Neuroscience at the Norwegian University of Science and Technology, they are doing groundbreaking research aimed at understanding how memory is encoded, stored and retrieved, and how the brain's navigational system works.

NQ: SfN is pleased to be partnering to develop BrainFacts.org. What are your aspirations for the site's content and strategy?

Lord Sainsbury: I am supporting BrainFacts.org because I believe it will serve a unique and important function that is presently unfilled: assembling and disseminating scientifically vetted public information about the brain and nervous system to the broad public, sub-university level science educators, and public policy audiences. This will strengthen public awareness of growing scientific knowledge about the brain and how basic physical and life science research translates to better human health. It will help dispel "neuro-myths" and decrease misunderstanding and lack of knowledge that lead to illness, stigma, and suboptimal health outcomes; it will stimulate greater academic interest and enthusiasm among young people by providing science teachers with easy access to teaching tools and resources; and hopefully increase public support for brain research funding by showcasing how research happens, demonstrating tremendous progress to date, and informing policy deliberation about brain science.

Fred Kavli: BrainFacts.org will be an innovative Web-based "portal" that provides reliable, non-commercial information

about neuroscience for teachers, policy makers, and the general public. This fits one of the key missions of The Kavli Foundation, which is to promote public understanding of scientific research. With SfN's vision, leadership and resources, we see *BrainFacts.org* becoming the most trusted public source for this kind of information. People will come to the site to learn about brain research, understand about brain diseases and disorders, learn how to promote brain health and wellness... even to learn what they need to know to write better laws and policies related to science and health. Teachers will come for up-to-date and exciting education resources. And as time goes on, the site will become deeper and better, with multimedia and social media being integrated into the site. We were excited to partner not only with SfN but with The Gatsby Charitable Foundation in supporting this initiative of SfN. Foundations working together can move us forward faster when the right opportunity presents itself. This was one of those opportunities.

NQ: As funders working on a global stage, what opportunities do you see in the globalization of science?

Lord Sainsbury: Science has always been a global endeavor, but in recent years the international dimension of science has greatly increased. In the UK between 1996 and 2000, 29 percent of UK scientific publications were internationally co-authored. Between 2001 and 2005 this figure rose to 40 percent. Solving the mystery that is the brain is a vast project and effective global collaboration will accelerate the discoveries that are ready to be made. As a foundation, we have a long standing history of welcoming partnership with other funders (e.g., Wellcome Trust, Kavli Foundation). We also encourage collaboration between our grantees. For example, the three theoretical neuroscience centers we support in London, New York, and Jerusalem have now been meeting and collaborating for five years. We are keen to ensure that our new initiative, the Sainsbury Wellcome Centre for Neural Circuits and Behaviour, will be part of a global network of neuroscience initiatives worldwide.

Fred Kavli: That's an interesting question, because we know that science does take place globally and also that the results of experiments should not depend on where an experiment is done. This is fundamental to science. So, having more people around the globe able to check and reproduce new results should help science progress even faster. We have institutes on three continents, we've endowed programs such as the Kavli Royal Society International Centre outside London, and of course the Kavli Prize is an international prize. And just last year, our Kavli Prize Science Forum brought together some of the world's most important leaders in science and science policy to discuss how to make international cooperation in science research more effective.

As for the opportunities, there are so many. One can look in any direction and find areas that deserve global efforts. Medicine and public health, energy science and technology, climate change, water resources, agriculture... look at any of

these areas and you discover issues that transcend national boundaries. Global warming is the one that probably comes quickest to mind. But what I think is important right now is, as science is needed to address global issues and changes, greater effort must be made to ensure a healthy, coordinated blend of international cooperation that gives everyone confidence in the scientific findings. We must also make certain that nations — particularly developing ones — appreciate that being part of a global science community is a key to their own social and economic development, and for meeting the multiple needs of their people.

NQ: Philanthropy is growing and is fast becoming another innovation hub for programming that supports science; it might include increasing public awareness, focusing intense resources on understanding a single disorder, or working to improve coordination across scientific fields and specialties. What role do you think the philanthropic community can and should play to support continued scientific innovation?

Lord Sainsbury: Philanthropy has a unique role to play in science — it can move quickly, and can drive and support projects in innovative ways, much more than government funding or large established charities who have to be mindful of the public nature of their support. The ability to be agile and operate with minimal bureaucracy is a powerful tool. It is much easier to take risks and accommodate the consequences. Another important role that private philanthropy can play is as a neutral convening agent, with no baggage or bias, only the goal of focusing on the issue at hand. This simple ability can often allow the right people to be brought together to collectively agree on actionable agendas across science. Funding of pilot type studies is another area we can drive forward, allowing scientists to gather critical data that puts them in the position of being able to get larger grants from government agencies or other funders.

Fred Kavli: The roles you mention are excellent ones. I would add that, while philanthropies can never be an economic engine on the scale of a government, we can and must support research that does not always have the constraints frequently associated with government grants. This is particularly important in basic research, where the most exciting work often comes from early work that has great risk that it might fail, but may also have even greater benefit if it turns out to be right. Yet such risky scientific ideas are almost always too risky for government funding agencies. Philanthropy can play a role in filling this critical gap. Philanthropies can provide funding where this kind of gamble is understood and accepted. We can also react more quickly to the latest opportunities and innovations, and bring together unique assemblies of researchers simply to encourage innovative thinking, help facilitate a new direction in research, or to develop new and unexpected partnerships. Among other programs, this is one of the objectives of our Kavli Futures Symposia. ■

Links Between Obesity and Addiction

Researchers have made great progress identifying the brain circuits involved in eating and appetite in the last decade. Now, with the increasing prevalence of obesity, much of that focus has shifted to studying unhealthy eating behaviors.

Recent research suggests a convergence between obesity and drug addiction. During a press conference at Neuroscience 2010, neuroscientists presented leading research that explores the overlap between the two. Session moderator Ralph DiLeone of Yale University School of Medicine noted both food and drugs have the ability to impart long-lasting — and potentially devastating — cellular and behavioral changes in people.

HIGH-FAT DIETS LEAD TO LONG-TERM BRAIN CHANGES

Teresa Reyes, University of Pennsylvania, presented evidence suggesting that an unhealthy diet might have long-lasting effects on gene expression in the brain, especially in the reward system.

The brains of mice fed a high-fat diet for an extended period of time showed long-term changes in the nucleus accumbens, ventral tegmental area, prefrontal cortex, and hypothalamus. Mice exposed to a 60-percent high-fat diet for six months showed epigenetic changes in these brain regions even after they were returned to a normal diet. The researchers found hypermethylation of the tyrosine hydroxylase, dopamine transporter, and μ -opioid receptor gene promoters that remained four weeks after the mice returned to a balanced diet.

Reyes suggested continuing exposure to high-fat diets could impart molecular changes in the reward system that are not easily reversed. Such consequences might make weight loss more difficult for some dieters.

STOMACH HORMONE FUELS SUGAR CRAVINGS

Ghrelin, the stomach hormone known to trigger hunger or fullness, also acts on the brain's reward and pleasure centers, according to new research. Karolina Skibicka, a postdoctoral fellow working with Suzanne Dickson at the University of Gothenburg in Sweden, reported findings that may help explain why people eat when not hungry and have implications for weight-control treatments.

Skibicka and her colleagues were interested in how ghrelin acts to incite food cravings. Recent research has shown

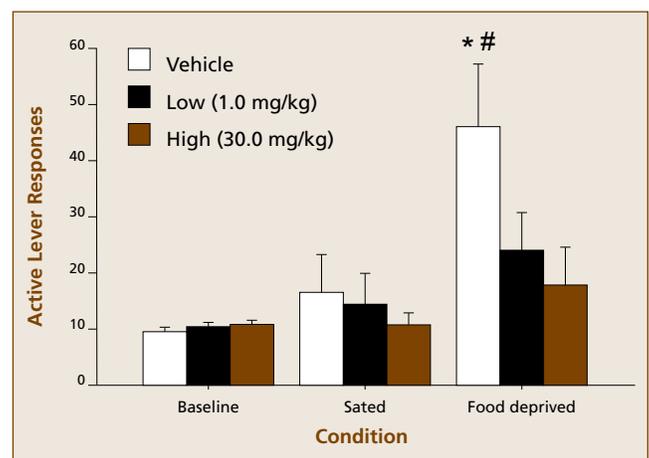
ghrelin moderates the midbrain dopamine system, indicating elevated ghrelin levels may result in changes in the brain's reward circuit. Skibicka's team used tests typically found in alcohol and drug addiction experiments to determine how ghrelin affects the motivation to obtain food. In the study, rats injected with ghrelin worked almost twice as hard to earn a self-administered sucrose reward as other rats. Yet when the hormone was blocked in hungry rats they were less willing to labor for a reward, as if they were full.

The researchers also found that increasing or decreasing ghrelin levels influenced whether the animals preferred environments they associated with sucrose consumption. These results suggest ghrelin plays an important role in the motivation to eat and may be a mediator of food craving.

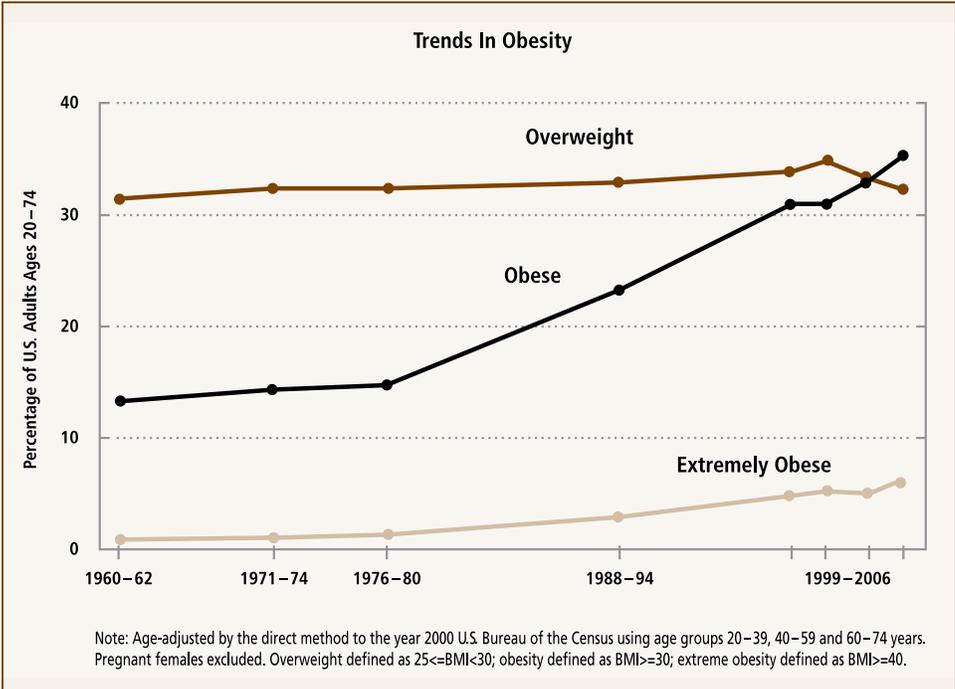
APPETITE-RELATED PROTEIN AFFECTS DRUG-SEEKING

Uri Shalev, Concordia University, studies the behavior of food-deprived rats to better understand why many drug addicts relapse, even after years of sobriety. When recovery from drug abuse fails, it is sometimes because a person feels extreme stress and turns to drugs to cope. Previous studies showed comorbidity between substance abuse and eating disorders, particularly with bulimia nervosa.

In animals trained to self-administer heroin and then weaned off the drug, the stress of caloric restriction causes



New findings suggest neuropeptide Y (NPY), which is released into the body during food shortage, helps trigger drug-seeking urges. Rats injected with a NPY Y5 receptor antagonist showed less heroin-seeking behavior following food deprivation. Image courtesy of Uri Shalev.



Studies show that rates of obesity are increasing rapidly. About two-thirds of adults in the United States are now overweight, obese, or extremely obese, according to data from the Centers for Disease Control and Prevention. Credit: Courtesy of the National Center for Health Statistics Health E-Stats, December 2008.

more than double the amount of cocaine was offered, the female rats still preferred the drug more than the males did. Interestingly, the preference disparity disappeared in ovariectomized females.

EARLY LIFE DIET AFFECTS BRAIN CENTERS THAT REGULATE WEIGHT

Children who are obese are likely to remain obese into adulthood. Does this indicate that key factors in a critical early phase of life determine a lifetime of obesity? Researcher Sebastien Bouret of the University of Southern California and Saban Research Institute thinks so.

Crucial brain development of appetite-related pathways occurs in the first few years of life. Bouret and his colleagues found leptin promotes axon

them to seek out drugs. Shalev presented new findings that suggest neuropeptide Y (NPY), which is released into the body during food shortage, helps trigger drug-seeking urges. In his study, rats injected with a NPY Y5 receptor antagonist didn't search for heroin, indicating NPY Y5 receptors are critical to drug-seeking induced by food deprivation. The findings, Shalev said, suggest a novel approach to the treatment of addicts who have eating disorders.

SEX MATTERS IN CHOICE BETWEEN FOOD AND COCAINE

Based on studies that show male and female rats respond differently to cocaine, graduate student Kerry Kerstetter set out to determine whether the sexes also act differently when presented with food. Kerstetter works with Tod Kippin, University of California, Santa Barbara.

Previous studies showed female rats work harder than male rats to acquire cocaine. In Kerstetter's experiments, rats trained to self-administer cocaine were presented with one lever for the drug and one for food. Female rats pressed the cocaine lever more often than the male rats, while the male rats largely chose the food. Even when

growth in the neonatal hypothalamus, while ghrelin blocks axon formation and growth. These results show the hormones that normally regulate feeding can influence hypothalamic development early on.

Bouret found nutrition also shaped appetite-related brain development. Mice that were overfed in the first three weeks of life became overweight; undernourished mice were underweight. But these changes in body weight remained into adulthood. Furthermore, these diet differences were reflected in the architecture of the hypothalamus. The researchers considered genetic factors, as well. Rats genetically predisposed to obesity showed abnormal wiring in the hypothalamus, making them less responsive to the effects of leptin in early life.

Together, these studies underscore the role of the brain in both healthy and unhealthy eating behaviors. They suggest that diet can have lasting effects on the brain, especially during development. Furthermore, they show the brain circuitry that developed to make eating pleasurable can be hijacked by poor dietary choices and abuse of drugs. ■

“After months of planning, which SfN actively participated in, the One Mind for Research event offered a powerful display of the enormous progress and promise of neuroscience,” said Susan G. Amara, SfN president. “More than ever, it is important to articulate to the public and political leaders the value of research at many levels, from the most basic to translational. The One Mind inaugural effort did just that and it was motivating to me as a scientist to see so much exciting and promising work presented.”

EARLY SfN SUPPORT FOR QUALITY SCIENCE

Kennedy launched his effort at the Neuroscience 2010 meeting in San Diego (see his speech at www.sfn.org/amhighlights). Following those remarks, Kennedy and Staglin met with the SfN Council to request the Society’s assistance in developing a strong scientific core for the campaign, and named neurobiologist and Harvard Provost Steven Hyman as chair of the One Mind for Research scientific advisory board. On the heels of that Council meeting, SfN President Susan Amara wrote a letter of SfN support and consulted closely with Hyman and One Mind for Research. The goal was to ensure the quality of neuroscience information presented at the forum and that the plan was of the highest possible caliber, reflecting a balanced focus on basic neuroscience as well as important translational work.

Under Hyman’s leadership, the Scientific Program Planning Committee included 20 scientists and physicians who broadly represent the field. The committee was organized by themes, aligned with four basic science sections — cellular, molecular/development, plasticity, repair/behavioral, systems, cognitive/neurobiology of disease — and two in clinical neuroscience, psychiatry and neurology. Four NIH directors also participated as full working committee members.

The plan, titled *A 10-year Plan for Neuroscience: From Molecules to Brain Health*, was developed under the leadership of Hyman and the One Mind Scientific Program Planning Committee. Designed as a living document outlining major emerging opportunities in brain research, it also benefited from input solicited from a wide range of individuals in the field. The Dana Foundation provided editorial assistance and SfN provided scientific illustrations. Visit www.1mind4research.org for a copy of the plan.

VICE PRESIDENT BIDEN KEYNOTES MOONSHOT LUNCH

In Boston, on May 25 — 50 years to the day since President Kennedy’s historic speech that focused the nation on a vision of space exploration — Vice President



One Mind for Research, initiated and led by former Rep. Patrick Kennedy, aims to energize neuroscience research and development throughout the next decade. The inaugural forum was held May 23–25 in Boston. David Fox, Photographer

Biden was the keynote speaker at a luncheon that concluded the conference.

Joined at the dais at the President John F. Kennedy Library and Museum by Apollo 11 astronaut Buzz Aldrin, Biden had much to say about the impact and urgency of neuroscience research: “The promise in this area is unlimited, and the need for further research is immediate. Thousands of our wounded warriors are returning with post-traumatic stress and traumatic brain injuries. For these and other reasons, our administration has made an unprecedented commitment to advancing understanding of the brain — through the NIH, through the National Science Foundation, through the Department of Defense, and through the VA,” he said. “We’re also supporting Congressman Patrick Kennedy’s bold new campaign, called One Mind for Research.”

“We cannot know with certainty what our fundamental recommitment to science and research and development will yield. But we do know from experience that the results will be greater than the sum of the parts, and the rewards will be far greater than the original investment,” Biden concluded.

A second event is being planned for May 2012, at University of California, Los Angeles, based on an invitation from UCLA Chancellor Gene Block, a neuroscientist. For more information about the Boston event, including videos supported by the Dana Foundation and produced by The Science Network, Vice President Biden’s speech, and the 10-year plan, visit www.1mind4research.org. ■

Advocacy Update

GET READY TO OPPOSE PROPOSED CUTS TO RESEARCH FUNDING

U.S. funding continues to be highly uncertain and contentious. With Congress looking to slash federal spending across-the-board every agency and program has the potential to be cut — including the NIH and the National Science Foundation (NSF). Now is the time for researchers to tell legislators not to stifle scientific innovation and investment — reminding them of the proven track record of NIH and NSF in medical discovery and ground-breaking treatments for millions who suffer from an array of diseases and disorders.

Without releasing funding for specific agencies, the House has already proposed cutting the Labor-Health and Human Services (HHS) Appropriations bill by \$18 billion (13 percent) — that would roll back funding to 2004 levels. NIH comprises approximately 18 percent of the overall Labor-HHS bill. According to Ranking Member Norm Dicks (D-WA), the approved Labor-HHS allocation by the House Republicans will set the NIH on the path to face “disturbing cuts.”

On the Senate side, senators are already setting their sights on cutting NSF funding. Sen. Tom Coburn (R-OK) released a report criticizing a number of NSF programs and calling for drastic cuts. While many of the claims made by the report have been refuted, it is clear some members of Congress are going after critical federal research programs.

As specific funding proposals become clear, the Society will call upon its U.S. membership to take the message of a strong scientific funding platform for NIH and NSF to their members of Congress during the summer congressional district work periods. Regularly check www.sfn.org/advocacy for details. Whether it's attending a town hall meeting, hosting a congressional lab tour, calling your legislators to support only strong and reliable funding for science research, or writing a letter to the editor on the power of biomedical research — all of these advocacy outlets will make an enormous impact on the future of science funding in the upcoming budget cycle.

U.S. CONGRESSIONAL NEUROSCIENCE CAUCUS HOLDS BRIEFING

On June 23, the Congressional Neuroscience Caucus held its inaugural event — a Capitol Hill briefing, “How Brain Research Is Unlocking the Mysteries Behind Neurological and Psychiatric Diseases and Disorders,” with former SfN President Joseph Coyle, Harvard Medical School, and Roger Reeves, John Hopkins University. Nearly 100 attendees from congressional offices and scientific research



Former SfN President, Joseph Coyle (right) and Dr. Roger Reeves (center) discussed neuroscience at the first briefing hosted by the Congressional Neuroscience Caucus with the caucus' co-chair, Rep. Earl Blumenauer (D-OR, left). The briefing highlighted how basic science is unlocking the mysteries behind neurological diseases and psychiatric disorders such as Down syndrome and PTSD.

organizations had the opportunity to hear how basic science is leading the way to better understand post-traumatic stress disorder and Down syndrome. The caucus, co-chaired by Reps. Cathy McMorris Rodgers (R-WA) and Earl Blumenauer (D-OR), focused on promoting a better understanding of how the brain develops, functions, and ages; building awareness of the critical role neuroscience plays in understanding and treating neurological and psychiatric disorders; and informing federal policy that fosters robust investment in scientific research through NIH and NSF. In his opening remarks, Blumenauer expressed his excitement about the caucus, and stated “neuroscience is the next frontier” and “this issue is one that affects every family, expands human knowledge, and influences policy.” The briefing was organized by the American Brain Coalition and sponsored by SfN. ■

ADVANCING PUBLIC UNDERSTANDING OF ANIMAL RESEARCH

SfN has been awarded \$180,000 in funding to launch the *Engaging the Public about Animal Research* (EPAR) project, which aims to expand public awareness about the vital role of animal research in scientific and medical progress. The funding, provided over three years by the Esther A. & Joseph Klingenstein Fund Inc., will go toward creating online educational resources geared toward key audiences and the general public. Resources created through the project will be housed on BrainFacts.org, a public information initiative of The Kavli Foundation, The Gatsby Charitable Foundation, and SfN, scheduled to launch in spring 2012.

Spotlighting Current Trends in Neuroscience Education

Educators at all program levels face challenges in training 21st century neuroscientists. To discuss those challenges as well as opportunities, SfN held the 2011 Annual Spring Conference of Neuroscience Departments and Programs (NDP) — *Current Trends in Neuroscience Education: Training the Millennial Student* — on March 25 in Washington, DC. The conference, planned by SfN's Committee on Neuroscience Departments and Programs (CNDP) and moderated by CNDP Chair David Riddle, generated spirited discussion among panelists and attendees.

KEYNOTE SPEAKER ON TEACHING AND LEARNING IN THE DIGITAL AGE

David Rose, founder and chief education officer of the Center for Applied Special Technology, opened the conference. Rose examined recent advances at the intersection of the learning sciences and the teaching sciences — fields of critical interest to neuroscientists — in the world of modern media. He focused on advances in our ability to meet the challenge of individual differences in learning style and highlighted the growing field called “Universal Design for Learning.” He gave an overview of the National Instructional Materials Standard, a standard for digital source files used to produce instructional materials for blind K–12 students and those with other print disabilities. He offered examples of how digital teaching tools can be used beyond this population, allowing students to more richly express what they've learned in the classroom.

FOCUS ON UNDERGRADUATE EDUCATION

Representatives from a range of educational institutions explored specific opportunities and challenges in undergraduate neuroscience training. Issues discussed included balancing curriculum needs, teaching classes of varying sizes, and providing research experiences.

Panelists noted several challenges at small schools in particular. Small departments typically include only a few faculty members representing neuroscience. Most small schools don't house a true neuroscience department, combining psychology, biology, and/or chemistry programs to appeal to a broader student base, which leaves neuroscience faculty competing for a limited pool of resources.

DECONSTRUCTING GRADUATE CURRICULA

This session focused on selected aspects of assessment strategies in graduate education and how to effectively incorporate non-didactic coursework into graduate training.

Panelists examined issues in designing and assessing comprehensive exams in graduate neuroscience programs, concluding that the most beneficial exams for both educators and students are ones that test knowledge of neuroscience as well as grant application writing. The role of journal clubs, which allow students to evaluate literature in depth and present material to their peers, also was discussed. Panelists found that giving students a guide on how to evaluate their chosen paper allows for a high-quality, structured student discussion without faculty intrusion.

Two graduate students from local neuroscience programs elaborated on these topics, giving the audience insights into their experiences with the comprehensive exam and journal clubs. Conference participants enjoyed the students' lively discussion and found the specific journal club methods discussed to be particularly useful.



More than 80 participants at the 2011 Annual Spring NDP Conference actively engaged in small group discussions, shared ideas and challenges, and offered feedback for future meetings.

View slide presentations and conference program at www.sfn.org/ndp.

WHAT DID ATTENDEES SAY?

"... an excellent conference. I always come away with new perspectives and information."

"... I left with a lot of new ideas, and also greatly appreciated the opportunity to network with faculty from other programs."

MS DEGREE IN NEUROSCIENCE

Master of Science (MS) degrees can be lucrative from an administrative standpoint, but their relevance in neuroscience is debated. Panelists examined the value and potential benefits of the thesis-based MS degree, the ideal format for an MS program, mechanisms for support, and resources required for a successful program.

Academic panelists noted the MS degree is useful to students exploring the neuroscience discipline and assessing their career goals before committing to a PhD program, noting that in Canada, the MS degree is considered an essential route to entry into graduate schools.

Industry panelists suggested that students who have an interest in hands-on research should pursue a master's degree. Having a master's degree is almost an entry-level requirement now for research assistant positions, as individuals with a graduate degree have a broader base of knowledge, more research experience, and a stronger sense of experimental design than those with just a bachelor's degree. Positions in industry available to those with an MS include research associates, lab personnel, and managers in various neuroscience disciplines.

FUNDING GRADUATE NEUROSCIENCE EDUCATION IN THE TWENTY TEENS

Representatives from the National Institute of Neurological Disorders and Stroke (NINDS) and the National Science Foundation (NSF) conducted an interactive presentation on funding for neuroscience training. Stephen Korn demonstrated new software developed by NINDS that helps program leaders track graduates and prepare the trainee data tables required for NIH training grants. Gisele Muller-Parker provided an overview of NSF funding mechanisms.

ADDITIONAL CONFERENCE ACTIVITIES

The conference also included an update from Shelly Dickinson, president of the Faculty for Undergraduate Neuroscience (www.funfaculty.org), and an overview of the ENDURE (Enhancing Neuroscience Diversity through Undergraduate Research Education) program by Michelle Jones-London, program director in the Office of Minority Health and Research at NINDS. ENDURE encourages and prepares undergraduate students from diverse backgrounds to enter PhD degree programs in neuroscience.

Charlotte Kuh, deputy executive director of the Policy and Global Affairs Division at the National Research Council (NRC), gave an overview of the latest *Assessment of U.S. Doctoral Programs* by the NRC, which has prompted diverse responses from the university community, and discussed possible changes in methodology for future assessments.

Small group discussions led by CNDDP members gave participants an opportunity to give feedback on topics for future meetings. Attendees left the conference with new perspectives and information they can share with their home institutions. ■

BECOME AN INSTITUTIONAL PROGRAM MEMBER

SfN has more than 180 Institutional Program (IP) members representing undergraduate and advanced degree programs in neuroscience and neuroscience-related disciplines in the United States and Canada. IP member benefits continue to evolve and currently include undergraduate student travel awards for the SfN annual meeting, a listing in the online searchable directory of neuroscience training programs, inclusion in the biennial survey, and communications access to students and other IP members. Visit www.sfn.org/IP for a complete list of benefits.

Save the Date! 2012 Spring Conference of Neuroscience Departments and Programs — March 30, 2012

Promoting Brain Awareness: A Year-Round Event

The 2011 Brain Awareness Week (BAW), March 14–20, culminated in more than 750 events in 52 countries and 36 U.S. states. Sponsored by SfN and the Dana Alliance for Brain Initiatives, BAW events elevate awareness and excitement about the brain worldwide through laboratory tours, classroom visits, and exhibits.

Washington, DC, kicked off BAW with an official proclamation from Mayor Vincent Gray honoring BAW during the National Museum of Health and Medicine's 12th annual BAW event, which drew more than 550 local students throughout the week.

Graduate students from Virginia Commonwealth University in Richmond, VA, demonstrated neuronal circuits to high school students using Spiker Boxes from Backyard Brains that allow one to record action potentials from insects. In Evergreen Park, Illinois, community-wide events targeted a wide range of age groups — from kindergartners through senior citizens. Activities were organized by former DePaul University English professor, Mary Miritello, along with the help of neuroscientists from Loyola University Chicago, and the Chicago SfN chapter. With grant support from two local banks, Miritello turned her interest in neuroscience into a full-scale outreach effort.

Other BAW events took place around the world, including Turkey, where more than 2,500 primary and secondary



Evan Stubbs, president of the Chicago SfN chapter and an associate professor at Loyola University Chicago, speaks with a high school freshman at the 2011 Brain Awareness Event in Evergreen Park, IL, organized by Mary Miritello.

school students received classroom visits from Eskisehir Osmangazi University neuroscientists. They were treated to conferences and a Brain Bee competition, as well as an artistic performance, “Brain, Rhythm, and Dance.”

SfN invites members to celebrate their BAW accomplishments at the Brain Awareness Campaign Event during Neuroscience 2011 in Washington, D.C., where SfN will announce the winner of the Brain Awareness Video Contest. SfN encourages members to organize educational neuroscience activities any time of the year. To get involved, visit www.sfn.org/baw. ■

NeurOnLine

fire together wire together



Who's on NeurOnLine?

Sherilynn J. Black, PhD
SfN Professional Development Committee Member
Duke University



Floyd E. Bloom, MD
SfN Past President, 1976–1977
The Scripps Research Institute



Join the Conversation

NeurOnLine is a members-only online community where members can share great science, network, and forge collaborations, — anytime, anywhere — within a trusted forum. As with the SfN annual meeting and *The Journal of Neuroscience*, *NeurOnLine*'s content and discussions are generated *by* members, *for* members.

- Discuss emerging scientific findings
- Explore new tools and techniques
- Network year-round within the global community, more than 41,000 members worldwide
- Share experiences and receive or provide mentoring on different career paths, stages, and challenges
- Get involved in public outreach, from Brain Awareness and science teaching to advocacy

NeurOnLine will help advance *your* science and career on *your* schedule.

Council Round-Up: Spring 2011 Meeting

The SfN Council met from May 31 to June 1 in Washington, DC, for its annual spring meeting. The following highlights some of the key discussion items.

SfN FY2012 OPERATING BUDGET

Council passed the fiscal year 2012 Operating Budget and approved several new program initiatives that include investments in member services, professional development programs, expanded public outreach, and technology projects that will enhance the effectiveness of the Society's activities and programs.

The new budget reflects increases in revenues consistent with the multi-year financial planning principles adopted by Council during the 2010 summer meeting. The approved budget projects a 10 percent increase in revenues and 7 percent increase in expenses, yielding approximately \$1 million in net revenue for the coming year, in line with Council and Finance Committee targets. The positive financial outlook for the coming year is in part due to an increase in new grant-funded activities, including significant new grants from The Gatsby Charitable Trust, The Kavli Foundation, The Esther A. & Joseph Klingenstein Fund (see sidebar, page 9), and the National Science Foundation.

After careful financial management through the worst of the economic downturn, Council believes the Society is well-positioned to selectively invest in important programs to meet member needs and strengthen the Society in the future.

ADVOCACY EFFORTS

In light of pressure to reduce federal spending, Council discussed strategies to advocate for continued strong funding of scientific research as an investment in the future. These strategies included a focus on tailoring positive advocacy messages to new members of Congress, identifying key members of Congress to serve as "champions" of science funding, and continuing to work closely with coalition partners such as Research!America, the Ad Hoc Group for Medical Research, the Coalition for Life Sciences, and the American Brain Coalition, making the case about the imperative of federal investment in scientific research.

COUNCIL ADVISORY GROUPS AND SUPPORTING MEMBER NEEDS

As SfN continues to make strides in areas as diverse as professional development, social technologies, and the annual meeting, guidance from volunteer leadership becomes increasingly important. Council members

Frances Jensen and John Morrison, co-chairs of the Professional Development Working Group, reported on the group's recommendations for carrying out the Society's Professional Development Strategy, such as a job fair at Neuroscience 2011 and a chapter grants program for local implementation of professional development workshops. They also endorsed a new travel award program for undergraduate students as well as guaranteed minimum funding for the existing travel award program. All of these recommendations were approved.

Marina Picciotto and Anthony Phillips, co-chairs of the Social Technology Advisory Group, reported on the status of SfN's online community *NeurOnLine* and discussed preliminary plans to develop an organization-wide mobile strategy.

Roberta Diaz Brinton and Sacha Nelson, co-chairs of the Annual Meeting Advisory Group, engaged Council in a discussion of potential enhancements to the annual meeting that will help the meeting continue to serve the ever-changing needs of attendees. They supported a recommendation for an annual meeting attendee survey to collect data on the meeting's overall quality and effectiveness, which was approved.

Nancy Ip and Howard Eichenbaum, co-chairs of the Member Survey Advisory Group, reviewed preliminary results from the 2011 Member Survey and discussed the changing needs of the Society's membership. A new Distinguished Traveling Scientist Program was proposed and approved as one response to changing needs.

INAUGURAL EDITOR IN CHIEF FOR BRAINFACTS.ORG SELECTED

Council voted to appoint Nicholas C. Spitzer as the inaugural editor in chief of the forthcoming public information initiative *BrainFacts.org*. Spitzer is Distinguished Professor of Biological Sciences at the University of California, San Diego, and is a long-time leader in neuroscience public outreach. He has served as SfN Councilor and is past chair of the Public Education and Communication Committee. Spitzer and a Council-appointed *BrainFacts.org* advisory board will identify additional editors to serve on the editorial board.

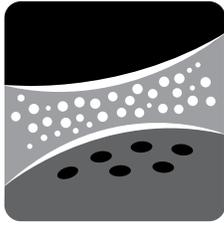
NEW CHAPTERS APPROVED

Upon the recommendation of the Membership and Chapters Committee, Council approved two new petitions to create the Rio de Janeiro chapter in Brazil and the Arlington-Fort Worth chapter in Texas. ■

NEUROSCIENCE 2011

The Premier Venue for Cutting-Edge Science

14



NEUROSCIENCE 2011

Neuroscience 2011 returns to Washington, DC for the 41st annual meeting of the Society for Neuroscience from November 12 to 16. Offering innovative topics and perspectives, Neuroscience 2011 promises high-quality scientific content, career and networking opportunities, and a wealth of services designed to meet the needs of neuroscientists.

The 2011 annual meeting scientific program is enriched by nine featured lectures, 14 special lectures, 18 symposia, and 31 minisymposia in areas ranging from studies of single molecules to human behavior. This year's Presidential Special Lecture series, featuring Cornelia I. Bargmann, Mu-ming Poo, Ann M. Graybiel, and Andrew P. Feinberg, celebrates innovation in technique, dialogues about nature "versus" nurture, and creative questioning to advance the field.

NEW ATTENDEE RESOURCES IN 2011

Attend the NEW NeuroJobs Career Day and Job Fair

As the number of students and postdoctoral members have increased in recent years, there also has been demand for expanded career resources and job placement offered to SfN members. To meet these needs, SfN created the NeuroJobs Job Fair at Neuroscience 2011. SfN is launching a one-day job fair at Neuroscience 2011, as a key feature of "Career Day" on November 12. The job fair will run concurrently with three professional development workshops offered throughout the day. The workshops explore a wide range of neuroscience career paths — academia, industry, advocacy, and other sectors. The job fair will feature numerous employer booths, with representation of corporate, nonprofit, and academic institutions to ensure a balanced representation of employers.

Attendees can access the NeuroJobs Career Center throughout the meeting, where job seekers and employers can meet to network and interview. The career center provides computer terminals for job seekers to find jobs and post resumes, and employers to post positions during the annual meeting. Eight dedicated interview booths will be available for employers to schedule interviews at the meeting.

Expanding Wireless Internet Access

For the first time, SfN is offering annual meeting attendees wireless Internet access on the poster floor and exhibit hall, in addition to areas throughout the Walter E. Washington Convention Center. Attendees can build a meeting itinerary, scan recent posts by 2011 Neurobloggers, or chat with others using SfN Interactive tools like Neuroscience 2011 twitter hashtags and SfN's Facebook page. A wireless support desk will be available for Internet connection assistance in the attendee services area.

WAYS TO CONNECT

Enhance your meeting experience anytime, anywhere by actively engaging on Facebook, Twitter, or with the 2011 Neurobloggers.

- Start meeting discussions early on *NeurOnLine* — neuronline.sfn.org
- Find Neuroscience 2011 on Twitter at @Neurosci2011 — Use and follow the official hashtag, #SfN11
- Apply to be an official Neuroscience 2011 Neuroblogger — www.sfn.org/neuroblogs

Bookmark www.sfn.org/am2011



DIALOGUES BETWEEN NEUROSCIENCE AND SOCIETY: NEUROSCIENCE & ECONOMICS *THE INTERSECTION OF BRAIN, BEHAVIOR, AND POLICY*

A unique highlight of this year's Featured Lecture series is the Dialogues between Neuroscience and Society presentation featuring groundbreaking economist and bestselling author Dr. Robert Shiller. Ranked among the 100 most influential economists in the world, Shiller's work has addressed how psychological factors influence decision-making in the economic arena and the impact of group dynamics on financial markets. His lecture presents an exciting opportunity to examine the interplay between economics and the human brain in a city known for international economic dialogue and impact.

SESSIONING YOUR SCIENCE

Sessioning scientific presentations and discussions for a meeting with 32,000 attendees and nearly 16,000 abstracts can be a challenge, but it is one that SfN volunteer leaders have honed over the past 40 years. Want to understand how it works and how you can help shape where your abstract is presented for future meetings? Peer into the abstract sessioning process for the world's largest neuroscience meeting with 2011 Program Committee Chair Scott Thompson.

Ensuring Your Abstract is Appropriately Assigned

Abstracts are submitted by a closing date, this year May 12. Following that date, the 40 members of SfN's Program Committee each review 400 to 500 abstracts in their area of expertise and place into poster sessions or nanosymposia. Thompson suggests forming a linking group with members of your lab or with labs working on similar topics, and thinking carefully about what theme and topic you choose for your abstract. Looking ahead to next year, take a look at the Neuroscience 2011 meeting content before Neuroscience 2012 abstract submission opens and see which theme/topic had the abstracts you would most like to see yours with.

Improving Presentation through Nanosymposia

To improve the quality of oral presentations, the Program Committee introduced Nanosymposia in 2009, allowing members to self-select into cohesive groups. Why? "In many, but not all, disciplines of neuroscience there is a 'culture' of preference for poster presentations over oral presentations," Thompson notes. "In those disciplines, the old slide sessions tended to be poorly attended due to the disparate collections of topics that had to be assembled to make up a session. The more coherent the session, the better attended it will be, and the more lively the discussion." To address this challenge, the Society has introduced a Nano Topic Matching Forum that facilitates self-assembly of Nanosymposia. Looking ahead to next year, join this growing forum and seek potential collaborators with similar topical interests in 2012. Submitting an abstract in a **linking group** improves your chances of being sessioned in a nanosymposium. ■

... SfN Announces 2011 Election Results, continued from page 1

Brenda Claiborne, incoming treasurer-elect, is the dean of the College of Arts and Sciences and professor of Biology at the University of New Mexico (UNM). She is also professor of Neurosciences in the UNM School of Medicine. This summer she transitions to Florida Atlantic University to serve as the University Provost, Chief Academic Officer, and professor of Biological Sciences. Her involvement at the Society spans more than two decades and includes serving as a member of the Education and Finance Committees, as well as the Minority Education, Training, and Professional Advancement Committee.

COUNCILORS

Li-Huei Tsai is the director of the Picower Institute for Learning and Memory and the Picower Professor of Neuroscience at Massachusetts Institute of Technology. Tsai served as an SfN Program Committee member and is an investigator at the Howard Hughes Medical Institute.

Michael Greenberg is the Nathan Marsh Pusey Professor of Neurobiology and chair of the Department of Neurobiology at Harvard Medical School. ■

Published quarterly by the Society for Neuroscience

Circulation: 40,000

© 2011 Society for Neuroscience

Opinions expressed in *Neuroscience Quarterly* do not necessarily reflect those of the Society or its officers and councilors.

Officers, Councilors, and Staff

President: Susan G. Amara

Past President: Michael E. Goldberg

President-Elect: Moses V. Chao

Secretary and NQ Editorial Advisor: Freda D. Miller

Secretary-Elect: Hollis T. Cline

Treasurer: Donald S. Faber

Past Treasurer: Marie-Francoise Chesselet

Treasurer-Elect: Darwin K. Berg

Councilors: Roberta Diaz Brinton, Anthony G. Phillips, Howard B. Eichenbaum, Frances E. Jensen, John H. Morrison, Sacha B. Nelson, Nancy Y. Ip, Marina R. Picciotto

Executive Director: Marty Saggese

Deputy Executive Director: Robert M. Doucette

Executive Editor: Mona Miller

Managing Editor: Melissa Ferrari

Editorial Staff: Lori Bocek, Leslie Church

Production Staff: Nicole Deoudes, Amit Kumar, Nadia Maseda, Beryl Roda

Neuroscience Quarterly is printed on New Leaf Reincarnation Matte made from 100% recycled fiber and 40% post-consumer waste, printed with vegetable inks, and processed chlorine free. By using this environmental paper, SfN saved the following resources:

trees
gallons of water
pounds of solid waste
pounds of hazardous effluent



Member Registration |

Now Open

Online registration is quick, easy, and provides immediate payment confirmation.

www.sfn.org/am2011

COLD SPRING HARBOR LABORATORY PRESS

www.cshlpress.com



Imaging in Neuroscience

Edited by Fritjof Helmchen and Arthur Konnerth

With more than 90 chapters, the manual offers a depth of coverage unavailable from any other source. Sections focus on imaging at the molecular level, axons and nerve terminals, spines and dendrites, neurons and circuits in vitro,

neurons and circuits in vivo, glia, brain dynamics and behavior, and brain pathology. Protocols range from basic techniques to recent breakthroughs.

©2011 1,084 pp., illus., index
Hardcover \$280
Paperback \$195

ISBN 978-0-879699-37-6
ISBN 978-0-879699-38-3



**Imaging
A Laboratory Manual**

Edited by Rafael Yuste

This is the cornerstone of a new laboratory manual series on imaging for the modern biology laboratory.

Designed as a general reference for all fields, this volume describes the theory and practice of a wide array of imaging methods—from basic discussions of optics, equipment, and labeling to detailed explanations of advanced, cutting-edge methods.

©2011 952 pp., illus. (182 color, 97 b/w), appendices, index

Hardcover \$240 ISBN 978-0-879699-35-2
Paperback \$165 ISBN 978-0-879699-36-9



**Live Cell Imaging
A Laboratory Manual,
Second Edition**

Edited by Robert D. Goldman, Jason R. Swedlow, and David L. Spector

This book is intended to be an advanced microscopy manual and presents hands-on techniques as well as background material, in the style and intent of the first edition, and is divided into two sections, the first covering the principles as well as fundamental issues of detection and imaging approaches, the second dealing with detailed protocols for imaging live cells, organelles and organisms.

©2010 736 pp., illus., appendix, index
Hardcover \$240 ISBN 978-0-879698-92-8
Paperback \$165 ISBN 978-0-879698-93-5



**Neuronal Guidance
The Biology of Brain Wiring**

Edited by Marc Tessier-Lavigne and Alex L. Kolodkin

Developing neurons respond to attractive or repulsive cues that influence the direction in which they grow and the connections they make. These cues are provided by soluble and cell-surface molecules that bind to receptors on neuronal growth cones, stimulating cytoskeletal rearrangements that cause the growing axon to change direction. This book discusses the tremendous progress made in our understanding of this process in recent years.

©2011 397 pp., illus. (87 color, 6 b/w), index
Hardcover \$135 ISBN 978-0-879698-97-3

We are pleased to offer a 10% discount to all Society for Neuroscience members. Use **Source Code SFN2011** when placing your order through our website, www.cshlpress.com. Additionally, if you are a member, or if you register on our site to become a member of our Discount Program, you will receive an additional 10% discount.

Discounts apply to direct website purchases by individual U.S. customers only.

