Society for Neuroscience
House Appropriations Subcommittee on Labor, Health and Human Services, Education and Related Agencies
FY 2010 National Institutes of Health Appropriations

Submitted by Thomas J. Carew, Ph.D.
President, Society for Neuroscience
University of California, Irvine
(949) 824-6114, tcarew@uci.edu

Introduction

Mr. Chairman and members of the subcommittee, I am Thomas J. Carew. I am the Donald Bren Professor and Chair of the Neurobiology and Behavior in the School of Biological Sciences at the University of California, Irvine, and President of the Society for Neuroscience (SfN).

Mr. Chairman, on behalf of the more than 38,000 members of the Society and myself, I would like to thank you and the members of this subcommittee for your past support, particularly the recent funds provided for the National Institutes of Health (NIH) in the American Recovery and Reinvestment Act (ARRA). This investment illustrates the confidence of Congress that research funded by NIH will continue to provide significant economic and health care returns to the American taxpayer.

I respectfully request that Congress provide for a consistent and reliable long term investment in NIH and in particular the field of neuroscience. Neuroscience includes research aimed at understanding the brain and the nervous system to better treat and prevent the thousands of diseases of the brain and nervous system that afflict millions of Americans.

Fiscal Year 2010 Budget Request

SfN is very grateful for the $10.4 billion in the ARRA for NIH. Already, the scientific community is hard at work pushing these dollars into high quality research while creating and preserving jobs. This investment will spur growth to help stimulate the national and local economies in these extraordinary times. After six years of budget increases that failed to keep pace with biomedical research inflation, resulting in the loss of 17 percent of NIH's purchasing power, the research funding in the ARRA is clear recognition of the role biomedical research plays in supporting our economy and laying the groundwork for future investments.

To ensure that the nation seizes on the scientific and economic momentum being driven by these funds and to maintain a robust research agenda, **we respectfully request an increase of 10 percent over the FY2009 level, providing a total budget for NIH of $33.35 billion for FY2010** with a goal of reaching $40 billion as soon as possible. By preventing NIH funding from dropping off a dramatic cliff at the end of FY 2010, this recommendation is a responsible way to ensure biomedical research continues to help drive the transformation of science, medicine and health. It also helps achieve the Administration's commitment to return science to its rightful place by doubling its funding over the next 10 years. At a time of abundant scientific

opportunities, global economic competition and unprecedented health challenges, it is imperative that NIH has the resources necessary to generate significant progress.

What is the Society for Neuroscience?

The Society for Neuroscience is a nonprofit membership organization of basic scientists and physicians who study the brain and nervous system. When the Society was first formed 40 years ago, it had less than 500 members. Today, SfN is the world's largest organization of scientists devoted to the study of the brain. Our member neuroscientists conduct research on the human brain to learn about its normal functions. They are also interested in learning how the nervous system develops, matures and maintains itself through life and how to improve treatment and prevention methods for psychiatric and neurological disorders.

Neuroscience is a unified field that combines biology, chemistry and physics with studies of structure, physiology and behavior, including cognitive and emotional functions in humans. Neuroscience research includes genes and other molecules that are the basis for the nervous system, individual neurons and neuron elements that make up systems and behavior.

NIH-Funded Research Leads to Advances in Health

NIH support has enabled neuroscientists to make significant progress in diagnosing and treating neurological disorders. Today, scientists have a much better understanding of how the brain functions, a few examples of which are illustrated in the below examples culled from SfN's *Brain Research Success Stories* and *Brain Briefings*. This neuroscience research and the possible health advances would not have been possible without constant and stable NIH support.

Post-Traumatic Stress Disorder –With a new generation of U.S. soldiers coming home after prolonged exposure to combat-related stress or trauma, understanding and treating PTSD has taken on an increased sense of urgency. One of the major unanswered questions about PTSD involves susceptibility. Not everybody who experiences psychological and/or physical trauma develops the disorder. Patients with PTSD have heightened levels of norepinephrine, a chemical involved in arousal and stress. High levels of this chemical strengthen the emotional reactions of the amygdala, a brain region involved in the fear response, while weakening the rational functions of the prefrontal cortex, which normally allows us to suppress troubling memories and thoughts. Research shows that a drug called D-cycloserine, when used in combination with behavioral therapy, appears to enhance the fear extinction process. Another drug, the beta-blocker propranolol, has shown some evidence of being able to prevent the development of certain PTSD features when administered within hours of a traumatic experience. Traumatic stress cannot always be avoided. But research is pointing to new and more effective ways of helping individuals successfully prevent or break the disabling cycle of recurring PTSD symptoms.

Memory Impairment – Another area of exciting discoveries, and one where I have conducted research, is memory impairment. While the battle against memory loss has gained significant ground in recent years, the advances are still not enough for those affected by memory impairment. NIH-funded studies found that a brain cell component termed the AMPA receptor aids the brain's memory system. A compound that targets the AMPA receptor has been shown to produce benefits in animals and is now being tested in patients with Alzheimer's disease.

Another study determined that activity at another brain cell component, the GABA B receptor, can suppress the memory process. Early findings indicate that a compound that blocks the receptor's activity improves the memory of patients with mild cognitive impairment. The far-ranging payoffs from a greater understanding of memory loss that affects many older Americans and the resulting development of new medications can only be attained with a continued and reliable investment in research.

Traumatic Brain Injury – Traumatic brain injury (TBI) is a complex injury with a broad spectrum of symptoms and disabilities, and the impact on a person and his or her family can be devastating. While MRI and CAT scans are often normal, the individual has cognitive problems such as headache, difficulty thinking, memory problems, attention deficit, mood swings and frustration. Research funded by NIH is pointing to new strategies that could take direct action against the injury and create much greater improvements in patient care. Techniques that hold promise include the use of transplanted neural stem cells that could potentially provide dramatic improvements in treating TBI. Scientists long imagined that, in the same way new bricks can repair a crumbling bridge, transplants of fresh cells might help rebuild damaged brain cell circuits that occur from a head injury. In addition, these cells might also be used to deliver small molecules that can protect the brain from further damage. Recent animal research, sponsored in part by NIH, provides evidence that cell transplant strategies may promote the repair of an injured brain and help restore lost abilities. Still, following TBI, the environment within which these transplanted cells must survive and grow is fundamentally changed. With continued support from NIH, researchers will have an opportunity overcome some of the limitations of current treatments and help improve the lives of thousands of people.

Basic Research – Fundamental Science

Robust and reliable investment in NIH is crucial to improve American health care *and* strengthen our economy. Basic research advances scientific knowledge and medical innovation by expanding the understanding of the structure and function of molecules, genes, cells, systems and complex behaviors.

Vision and Gene Therapy - Vision loss and eye disease affect 3.6 million Americans and cost the United States $68 billion each year. However, advances in vision research are helping to combat some types of eye disease. An unexpected finding decades ago — the crucial role of vitamin A in the visual system — and the genetic revolution that began with the decoding of the human genome have combined to create one of the first success stories for gene therapy and hope for vision restoration for people with Leber congenital amaurosis (LCA), a disorder once believed to be permanent. LCA, the most common cause of congenital vision loss in children, becomes more severe through adolescence, leading to complete blindness in adulthood. Researchers at the National Eye Institute discovered that a mutation of the RPE65 gene caused a form of LCA called LCA2 and in 2007, using both mice and dog animal models, developed a new form of gene therapy that improved the animals' abilities to respond to light. Subsequently, in preliminary studies of young adults with LCA2, researchers reported that the gene therapy improved vision. After receiving treatment, two participants who had been unable to see a hand waving in front of them could see well enough to move around without help. One participant's vision improved so much that he was able to read small print with the help of a magnifying glass.

This exciting breakthrough was the result of basic research conducted 70 years ago and has significant implications for gene research and therapy beyond the eye.

Plasticity and Alzheimer's Disease – Researchers in the 1960s wanted to understand more about growth and repair in the adult brain and conducted a number of experiments with rodents to help illuminate these processes. They made an amazing and unexpected discovery: newly created cells that later became neurons, or brain cells. This process, called neurogenesis, is just one example of how "plastic" or adaptable the brain is. With this knowledge, researchers are investigating how normal aging, as well as neurodegenerative diseases like Alzheimer's disease, affect that adaptability, and how we can maintain healthy brain function as we age. Future research may one day allow scientists to capture the adult brain's enormous capacity to adapt in order to help prevent, or perhaps even reverse, memory-robbing Alzheimer's disease.

The Pipeline of New Researchers

SfN is very concerned about the impact of the stagnant budget on keeping young researchers in the training pipeline. In 1990, young researchers received 29 percent of R01 grants (the premier NIH research grant needed to establish a researcher's credibility and independence), but by 2007, only 25 percent of such grants were awarded to young scientists. Additionally, the age of those receiving their first R01 has increased from 38 to 43.

Currently, science is balancing on a knife's edge, threatened with losing a generation of extraordinary scientists struggling for independence and resources. With flat or falling funding, a remarkable cohort of young people has been imperiled, at least in part, because the scientific enterprise has not been structured to prepare for career holding patterns. SfN is tremendously hopeful that the increasing support for science will encourage this next generation of professionals to stay the course, and that the science community will make it a high priority to ensure they have a place at the table. However, there is only a year or so before young scientists become an endangered species. If they are lost now, society loses their advances 20 to 40 years from now. And if they go, it will take a long, long time to reconstitute laboratory groups when funds come back in place. Once lost, intellectual, scientific, and personal momentum is incredibly hard to regain. A renewed, sustained focus on support for science would provide an extraordinary opportunity to strengthen the scientific enterprise by supporting young scientists.

Additionally, we are concerned that the U.S. may soon no longer be the global source of the basic and translational science that fosters advances in medicine. Decreases in the scientific workforce could have an adverse effect on local and state economies as universities and research institutions are the largest employers in some communities. Projects conducted by these institutions contribute to the growth in biotechnology, pharmaceuticals, device and imaging manufacturing and other industries.

We owe it to the next generation of scientists to ensure that they have the opportunity to pursue their passion for research and discovery, which ultimately provides benefits for all Americans.

Conclusion

We urge Congress to support President Obama's call to return science to its rightful place and double science funding over 10 years. Research funding is a proven pathway to better health and a stronger, high-tech, high-wage economy. Already, it has created new treatments to improve

health and quality of life. In particular, neuroscience has resulted in progress on PTSD and TBI affecting our troops, exciting discoveries in Alzheimer's and Parkinson's disease that will affect even more Americans as the nation ages, and amazing advances in restoring vision to individuals once thought to be permanently blind.

These exciting benefits to the nation's health care and the economy will not be fully realized if we do not seize the scientific momentum brought about by ARRA funds. SfN's recommendation of at least a 10 percent increase, supported by many in the research and patient advocacy communities**,** ensures there is not a dramatic drop in research funding at the end of FY2010 and allows the world's pre-eminent medical research enterpris**e** to accelerate the momentum of discovery to improve the health, quality of life, and economic well-being of millions of Americans.

Through the support of the Congress and the general public, NIH has become the world's leading medical research enterprise. Research funded by the NIH has created new treatments to improve our health and our quality of life. In the past 40 years, NIH funded research has successfully reduced the mortality and morbidity of once acute and lethal conditions by finding ways to improve treatment. Additional funding for NIH will make it possible to explore and understand the fundamental causes of disease at the earliest stages, and predict a disease before it develops.

The brain is the most complex living structure known in the universe. Neuroscience advances our understanding of the brain and nervous system by bringing together scientists of diverse backgrounds and encouraging translational research while applying new scientific knowledge to develop improved disease treatments and cures. We urge Congress to provide adequate federal funding to advance scientific understanding needed to improve the health of countless Americans.

Thank you for the opportunity to submit this testimony.

Sincerely,

Thomas J. Carew
President, Society for Neuroscience
Bren Professor and Chair
Department of Neurobiology and Behavior
University of California, Irvine