Written Statement

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Subcommittee on Labor, Health and Human Services, Education and Related Agencies
Appropriations Committee
In Support of FY18 Appropriations for the National Institutes of Health

Mr. Chairman and members of the Subcommittee, I am Eric Nestler and it is my honor to present this testimony in strong support of a $2 billion increase in funding for the National Institutes of Health (NIH) for FY18. I am offering this testimony in my capacity as President of the Society for Neuroscience (SfN). I am the Dean for Academic and Scientific Affairs at the Icahn School of Medicine at Mount Sinai, where I am also the Director of the Friedman Brain Institute and professor of neuroscience, pharmacological sciences, and psychiatry. My laboratory studies the molecular mechanisms of drug addiction and depression in animal models – a critical topic given the current crisis around opioid addiction across the U.S. and stress-related disorders and suicide among our nation's Veterans.

SfN believes strongly in the research continuum. Basic science leads to clinical innovations, which lead to treatment advances that impact the public's health. Basic science is the foundation upon which all health advances are built. The Society stands with many others in the biomedical research community in support of an increase in NIH funding of not less than $2.0 billion above the final FY17 level, supplemented (not supplanted) by releasing the full funding for the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative in the 21st Century Cures Act that passed Congress with overwhelming bipartisan support.

While the final funding level for FY17 is unknown, we should build upon Congress's success in enacting a $2.0 billion increase for NIH in the FY16 Omnibus appropriations act. This

commitment to sustained, robust funding for NIH maximizes the impact of every dollar appropriated and is the fastest way to move from discoveries to treatments and cures.

SfN counts nearly 37,000 members world-wide, most of whom are U.S.-based scientists, teachers, and clinicians. We are dedicated to advancing the understanding of the brain and spinal cord. That is why we are deeply appreciative of Congress's efforts in FY16, which broke a streak of nearly 13 years where funding failed to keep pace with the annual rate of biomedical research inflation. During these years there was a nearly 25 percent loss of purchasing power of NIH-funded science throughout the U.S. Now, it is critical to maintain the new pace at the conclusion of the FY17 process and the FY18 bills you are now formulating.

We are also grateful for your support of the BRAIN Initiative. While only one part of the research landscape in neuroscience, BRAIN has been critical in promoting future discoveries across neuroscience and related scientific disciplines (see an example below). By including part of the funding in 21st Century Cures – and note that it is only part of the annual funding that BRAIN will require – Congress helped maintain the momentum of this endeavor. Please remember, however, using those funds to supplant regular appropriations would be counterproductive. There is no substitute for robust, sustained, and predictable funding for NIH.

The deeper our grasp of basic science, the more successful those focused on clinical and translational research will be. We use a wide-range of experimental and animal models that are not used elsewhere in the research pipeline. These opportunities create discoveries – oftentimes unexpected discoveries – that expand knowledge of biological processes at the molecular, cellular, and brain circuit levels. These levels of discovery reveal new targets for research to treat brain disorders of all kinds that affect nearly a billion people worldwide.

As the leading scientific society dealing with the brain and nervous system, SfN hosts one of the largest annual scientific meetings and publishes two highly-rated scientific journals. We are also committed to educating the public about healthy and unhealthy brains and, of course, engage policymakers regarding the tremendous progress we have made and the potential that lies ahead for brain research. Some recent, exciting advancements include the following.

The Impacts of Neuroscience Research

Understanding the Relationship Between Genes and the Brain

My own NIH-funded research investigates the links between neuropsychiatric disorders and the changes in gene expression that occur over a lifetime (epigenetics). These epigenetic changes can be influenced by life experiences, including exposure to stress, drugs of addiction and natural factors like hormone cycles. My lab seeks to understand how these epigenetic mechanisms lead to life-long changes in brain function in disorders such as depression and drug addiction, and provide new routes of investigation for possible treatment. For example, my work looks at how the regulation of key genes in single brain regions affect the expression of a network of other genes, which underlie an individual's susceptibility versus resilience in neuropsychiatric disorders. In particular, we study how gene regulation changes susceptibility in response to chronic stress or drug exposure in mice and depression or addiction in humans. In identifying new molecular and genetic mechanisms that underlie these complicated disorders, we are now working to advance these discoveries into new and more effective treatments.

Recording the Brain Without Damage

The BRAIN Initiative, now in its fourth year, continues to bring together researchers from the life sciences, physical sciences and engineering to create new tools and technologies that allow neuroscientists to expand our understanding of the brain and nervous system. One

BRAIN Initiative project produced a flexible and ultrathin electrode grid (NeuroGrid) that records the activity of single neurons on the surface of the human brain without damaging the brain itself. In addition to NeuroGrid's potential use in clinical settings, such as determining areas of the brain causing severe epilepsy, it is also a powerful tool for more basic research. Because the NeuroGrid causes no damage to the brain, it can record in areas, such as those involved with language, where even the most minor lesion could lead to a loss of function. NeuroGrid is a critical tool for understanding the connections between neuronal activity and human behavior, one of the seven key principles that underlie the BRAIN Initiative.

Identifying Individual Cell Signatures

While neuroscientists often think of the brain in terms of groups and networks of neurons and non-neuronal cells working together, NIH's Single Cell Analysis Program takes a different approach. The Program funds research investigating individual cells and cell types to understand how these cells affect everything from response to disease treatments to their function in a larger network. In this program, researchers have been able to create long-lived, healthy cell cultures of human brain tissue. Scientists then analyzed these cultured brain cells to determine their cell type, and were even able to find epigenetic effects of medications taken by the patients from which the samples originated. In addition to providing information about the unique properties of the tens of thousands of cell types that make up the human nervous system, this technique also provides a new and powerful model for testing the molecular and epigenetic effects of drug treatments, and for understanding how these different cell types interact to form the basis of the functioning human brain in health and disease.

The Impact of Neuroscience Investment

In addition to physical health, there is a significant impact of this research on the economic health of our communities and nation as well. Funding for NIH supports roughly 400,000 jobs and $58 billion in economic activity throughout the fifty states. As you may know, nearly 83 percent of NIH's budget goes directly to universities, research institutes, and hospitals. Another nine percent funds cutting edge research by NIH's world class scientists.

Congress's commitment to fund basic and translational neuroscience created the essential foundation for developing a deep and thorough understanding to address diseases that strike more than 100 million Americans every year, more than a quarter of our population. Perhaps the most frightening number to consider, however, is $760 billion. This is the current estimate of the economic impact on American families and the economy of neuro-related diseases. This number will only grow into the trillions as our population ages in the years ahead, unless we act.

The U.S. has long been the world leader in biomedical research related to neuroscience and many other fields. But other nations, particularly in Asia and Europe, are investing heavily to catch up with – and pass – us in the near future. Much of the research done at NIH cannot be accomplished in the private sector or with philanthropic support. It is too expensive for charities; it is too far from the profit centers for private industry. Only Congress can take the steps necessary to ensure the future will see progress in the development of cures, treatments, and methods of prevention that will assure a better, healthier future for all Americans.

On behalf of the scientists and physicians of the Society for Neuroscience, we thank this Subcommittee for its past support and we look forward to working with you in the months and years ahead to provide health and economic benefits to your constituents. The opportunity to create previously unimaginable progress is knocking at our door. We just need the courage and the wisdom to answer it, welcome it, and implement it with great foresight.