Written Statement

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Subcommittee on Labor, Health, and Human Services, Education, and Related Agencies
Appropriations Committee
In Support of FY2017 Appropriations for the National Institutes of Health

Mr. Chairman and members of the Subcommittee, my name is Hollis Cline and I am privileged to offer this testimony in support of increased funding for NIH for FY2017. I offer this testimony in my capacity as president of the Society for Neuroscience (SfN). I am also the Chair of the Department of Molecular and Cellular Neuroscience and the Director of the Dorris Center for Neuroscience, as well as Hahn Professor of Neuroscience in the departments of Molecular and Cellular Neuroscience, and Chemical Physiology at The Scripps Research Institute in La Jolla, CA. My research focuses on determining how the mechanisms of sensory experience affect the brain's structure, development, and function.

SfN believes that discoveries in basic science that will lead to needed breakthroughs can occur only through strong, consistent, and reliable finding to NIH. The Society stands with others in the research community in requesting at least $34.5 billion in discretionary funding, as part of a 10% overall increase, for NIH in the FY2017 Labor/HHS appropriations bill. This level of support builds on 2016 and pushes research forward. It is time to return research to a trajectory of sustained growth that recognizes its promise and its importance for health and that will serve as a springboard for economic development. FY2016 was a great first step and we cannot back away from its potential now.

On behalf of the nearly 40,000 members of SfN, thank you for your tremendous support of both the NIH and neuroscience research in the past, and especially in FY2016. The two billion dollar increase in federal support for NIH significantly contributes towards getting the agency back on a path of robust, sustained and predictable funding to fuel a future of great discovery. Thank you also for your support and investment in the NIH portion of the Brain Research through Advancing Innovative Neurotechnologies (BRAIN) Initiative. As one crucial part of the overall federal investment in neuroscience, NIH-funded BRAIN programs promote future discoveries across many areas of neuroscience and other research disciplines. As you will see below, BRAIN continues to burst with potential and has already borne fruit in the field of scientific tool development. For the reasons below, continuing your strong and consistent support of NIH is critically important.

SfN's mission is to advance the understanding of the brain and nervous system. We believe this understanding occurs through a better and deeper grasp of basic science. By its nature, basic science is more curiosity-driven than translational research, allowing for greater experimentation. By employing the wide range of experimental systems and animals models not used elsewhere in the drug development pipeline, basic scientists have the ideal platform for making unexpected discoveries that lead to greater knowledge of biological processes. Increasing our basic understanding of the human brain and the diseases that affect it affords neuroscientists the best opportunity to identify new biological targets and then find and test compounds to treat brain disorders affecting countless people around the world.

SfN leads efforts to disseminate and discuss emerging neuroscience discoveries, hosting one of the world's largest annual scientific meetings and publishing two leading scientific journals. SfN is also committed to actively educating the public about the brain, both in health and in illness, and to engaging policymakers regarding the tremendous progress and potential of brain research.

Cross-Disciplinary Neuroscience

Now entering its third year, the Brain Research through Advancing Innovating Neurotechnologies (BRAIN) Initiative continues to push cross-disciplinary research in neuroscience. Drawing on knowledge from the life sciences, physical sciences, and engineering, brain research is among the most promising and productive areas of science today. Combining the talents of chemists, engineers, computational scientists and neuroscientists, the basic research funded by NIH at universities and hospitals across the nation leads to discoveries that will inspire scientific and medical progress for generations. Past NIH-supported projects helped neuroscientists make tremendous strides that led to advances in the diagnosis and treatment of neurological and psychiatric disorders. The following examples are just a small selection of the many success stories made possible by brain research funded by investment in NIH.

Repairing the Brain

My own NIH-funded research investigates how an injured brain can be repaired to address conditions such as glaucoma and brain damage. I look to mechanisms involved in brain growth and development for possible answers and treatments. In order to understand how the brain grows and matures, I study how input from the body's senses affects the development of the brain's structures and their function. For example, my work looks at the visual systems in tadpoles to see how sensory system stimulation can help trigger the birth of new cell growth, which can change the growing brain and help the injured brain recover function. Future research in this field will attempt to use genes and pathways related to neuronal growth to better understand how the brain may be able to heal itself.

Affecting Behavior at the Cell Level

How neurons interact with each other is the basis of all our thoughts and behaviors. One key to understanding the brain is studying the communication between neurons. DREADD 2.0, an upgrade of a widely-used technology (also called DREADD—Designer Receptors Exclusively Activated by Designer Drugs), developed in part with long-term NIH funding, allows researchers to turn neurons "on" and "off". Using DREADD 2.0, researchers are able to both change the activity of neurons and learn how neuron communication changes when they are active or silent. This new technology brings specific neurons under the direct control of a scientist, who can then test the function of those neurons and the behaviors they produce like never before. Currently limited to mice, DREADD 2.0 and other technologies set the stage for a deeper and more thorough exploration of the brain and behavior. This research will help seed discovery of potential treatments for disorders of the nervous system, like Alzheimers Disease and schizophrenia, which are thought to occur when neuron communication breaks down.

High Resolution Reconstruction of Mouse Cortex on a Nanometer Scale

A collaboration of several researchers funded by the BRAIN Initiative produced a database of information about the cells in a small part of the mouse cerebral cortex. Using this database as a

digital model for the larger brain, researchers are able to explore the physical properties of neurons and learn more about how brain cells interact and communicate. This new knowledge will help researchers understand a wide range of neurological diseases in which this communication suffers. The approaches used in this work, and the results it has produced thus far, address multiple goals of the NIH BRAIN Initiative, including cross-disciplinary efforts to develop technologies to better characterize different types of cells and their connections throughout the brain. This fundamental knowledge is essential in order to understand how the brain differs between healthy people and those with brain diseases.

Neuroscience: An Investment in Our Future

Sustained investment to stimulate and speed these discoveries is essential to American healthcare and economic well-being. Funding for research supports quality jobs and increases economic activity. NIH supports approximately 400,000 jobs and $58 billion in economic output nationwide. Eighty-five percent of NIH's budget funds extramural research in communities located in every state.

Moreover, major investment in basic and translational neuroscience is not only fueling an enduring and vital scientific endeavor, it is the essential foundation for understanding and treating diseases that strike nearly one billion people worldwide. There are more than 1,000 debilitating neurological and psychiatric diseases that strike over 100 million Americans each year. This, in turn, produces severe hardship for millions of families and costs the U.S. economy at least $760 billion a year, with future expenses reaching the trillions looming for several conditions. Advances made possible by publicly-funded research will help us maintain, and perhaps someday restore, healthy brain function. With funding from NIH, researchers are working towards lifesaving breakthroughs.

Finally, without robust, sustained investment, America's status as the preeminent leader in biomedical research is at risk. Other countries are investing heavily in biomedical research to take advantage of new possibilities. Even with growing philanthropic support, the private sector cannot be expected to close the gap. The lag-time between discovery and profitability means that the pharmaceutical, biotechnology, and medical device industries need federally-funded basic (also known as fundamental) research to develop products and treatments. The foundation that basic research provides is at risk if federally-funded research declines.

Conclusion

We live at a time of extraordinary opportunity in neuroscience. A myriad of questions once impossible to consider are now within reach because of new technologies, an ever-expanding knowledge base, and a willingness to embrace many disciplines. Thank you for this opportunity to testify.