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Public Witness Hearing on the
FY 2015 Appropriation for the National Institutes of Health
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Subcommittee on Labor, Health and Human Services, Education and Related Agencies
Committee on Appropriations
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Good morning. My name is Jonathan Lewin, and I am President of the Academy of Radiology Research, a national organization representing imaging scientists, radiology societies, industry partners and patient advocacy organizations. Together, our organization represents the tens of thousands of academic imaging scientists and industry researchers who are developing the cutting-edge imaging technologies that continue to change the face of medicine. Thank you for the opportunity to testify before the subcommittee.

The Academy is pleased to respectfully recommend a fiscal year 2015 funding level of **$32 billion for National Institutes of Health (NIH)** and **$397 million for the National Institute of Biomedical Imaging and Bioengineering (NIBIB)**, a $70 million increase that will accelerate the current technological revolution in medicine, help build a cost-efficient health system based on prevention, and stimulate one of our nation's strongest export industries.

As a long-time NIH investigator and a senior administrator at one of the country's largest research institutions, biomedical research is near and dear to my heart. I currently have the honor of serving as the Senior Vice President of Integrated Healthcare Delivery for Johns Hopkins Medicine, as well as the Chair of the Department of Radiology and Radiological Science. Like my colleagues at other institutions, I get to see first-hand the incredible work that NIH-funded scientists are doing to save lives, improve the health care delivery model and contribute to the local economy. But while this is an exciting time for medical research – particularly within the imaging community – conversations among investigators about the future of medicine almost invariably turn to the distressing state of American science, with more and more anecdotes of high-scoring applications going unfunded, junior scientists leaving for other countries, and budding young labs being forced to close down.

If the "doubling" of NIH from 1999 to 2003 represented a "boom" in funding, the past decade unfortunately represents the "bust." Looking back to fiscal year 2004, NIH funding stood at $27.8 billion. A decade later, NIH now stands at $29.9 billion – meaning that our engine for medical

breakthroughs in the U.S. has grown a total of 5% over the past eleven years, or at an annualized rate of 0.6%. Not only have years of progress towards cures and treatments been lost, but this flat-line rate of growth is not reflective of an economy whose future depends on two essential fiscal outcomes: creating jobs by out-innovating emerging economies, and lower long-term healthcare costs made possible by research discoveries.

Looking globally, NIH Director Francis Collins stated before this Subcommittee that other nations are "ramping up their support of biomedical research because they've read our playbook." Indeed, both emerging and developed economies continue to prioritize public funding for medical research and development, relying on biomedical innovation as one of the fiscal cornerstones of their own economic recoveries. If we wish to maintain our competitive advantage in biotechnology, something that is critical to our country's economic blueprint, we must return to the days when we adequately funded the vital basic research that creates jobs, spurs economic growth and improves patient care. If the NIH budget had maintained even a modest level of 3% annual growth since 2004, NIH funding would stand at a more sustainable $38.5 billion today. Therefore, the Academy's modest request of $32 billion represents an important step towards re-securing our global leadership in medical technology, while delivering the healthcare knowledge that leads to a healthier America and the clinical innovations that can reduce our overall healthcare expenditures moving forward.

Imaging Research at NIH and NIBIB

As an imaging scientist and Radiologist, I've also been fortunate to be a part of a medicine's technological revolution, one that has brought imaging and engineering to greater prominence in the biomedical arena. Imaging is currently used in 88% of all diseases that NIH studies, while playing a leading role in a number of the NIH's signature initiatives, including the Human Connectome Project, the newly announced BRAIN Initiative, and the Alzheimer's Disease Neuroimaging Initiative. The National Cancer Institute also continues to play a critical role in cancer imaging through funding for

the American College of Radiology Imaging Network (ACRIN). Through ACRIN, the National Lung Cancer Screening Trial recently found a 20% reduction in mortality for at-risk populations using low-dose CT screening. This study is a watershed moment for those at-risk for lung cancer, and will almost immediately begin saving lives and resources by catching lung tumors earlier than ever before.

However, it is important to recognize that imaging advances such as these would not be possible without the National Institute for Biomedical Imaging and Bioengineering (NIBIB). NIBIB was created by Congress in 2000 to provide a home for the development and application of new and emerging medical technologies, with the goal of building a smarter, technology-enabled healthcare system based on early detection, prevention and personalized treatment. Since its establishment, NIBIB has supported interdisciplinary teams of physicians, bioengineers, medical physicists, chemists, computer scientists and numerous others required to advance the fields that stand at the crossroads of medicine and technology.

The investment in NIBIB's research is particularly valuable, considering there are three distinct and tangible outputs from NIBIB research: the first are ***bench-to-bedside imaging technologies*** that help medical professionals diagnose, treat, and monitor a wide array of diseases and conditions, saving millions of lives each year and avoiding unnecessary surgeries and hospital admissions. The second are ***new bench-to-bench research tools*** – such as the new imaging techniques being used in the BRAIN Initiative or the Human Connectome Project - that have given researchers in other areas of science game-changing new ways to advance the diseases that they study. And finally, NIBIB research provides the ***basic research pipeline for commercial diagnostic and therapeutic devices,*** one our country's strongest export-industries as identified by the Department of Commerce.

At Hopkins, we currently have an exciting project that embodies all three of these tangible research deliverables, and is aimed at tackling one of our country's most threatening public health concerns: obesity. This particular grant uses the image-guided injection of microbeads to embolize the

small artery in the stomach that supports a key hunger hormone called ghrelin. By finding exactly the right artery, and thus the supply of nutrients and oxygen, the interventional radiologist can inject microbeads that impede the blood supply and down-regulate the amount of ghrelin that is produced – resulting in less desire to eat and sustainable long-term weight loss. This minimally-invasive procedure has the potential to replace more expensive and risky bariatric surgery, as well as create a whole new manufacturing facility around Hopkins for the novel microbeads that make the technique possible. The application for this project recently came back with a perfect score from NIH – a number ONE priority score from peer review – but amazingly and inexplicably was rejected by the NIH Institute to which it was assigned. At that point NIBIB stepped in and, despite a budget six times smaller than the original Institute, funded the grant for all the compelling reasons that resulted in a perfect score during peer review. Thanks to the NIBIB, a cost-effective, technology-based solution is now being developed to address one of our country's most expensive and deadly public health issues.

NIBIB's central role in this technological revolution in medicine is perhaps best demonstrated in a recent NIH patent analysis completed by the Academy of Radiology Research, which is in the process of being published in the peer-reviewed scientific literature. Looking at the various NIH Institutes from 2003-2012, NIBIB produced new pieces of intellectual property, as measured by patent generation, at the highest rate across NIH. For every $100 million in NIH funding, NIBIB generated 16 patents, compared to 2.5 patents across the rest of the NIH. Put another way, it requires just $6 million of NIBIB funding before one patent is generated, compared with $39 million per patent across the NIH as a whole. Considering the private sector invests $3.4 million on average to develop one patent, NIBIB research is creating new intellectual property at private sector levels of efficiency.

To also look at the quality of patents across NIH, the Academy's analysis also looked at forward citations – which are references by future patents back to the original NIH patent. Forward citations are a well-studied metric that can help identify truly pioneering discoveries: the more forward

citations, the more downstream lines of future R&D were spurred, and the greater the odds that the original patent was the intellectual cornerstone for a budding new product or industry. In this part of the Academy's analysis, NIBIB patents averaged 13 forward citations – or 13 additional patents spurred – for every patent it created. This was nearly double the NIH average of 7.9 forward citations, and 10 times more downstream patents generated from private-sector biotechnology patents.

Perhaps even more surprising, NIBIB's patent production and quality over the last decade has outpaced other prominent federal R&D programs, such as DARPA, NSF and NASA – programs that conduct a large amount of applied science and are geared towards product development. The fact that NIBIB is perhaps the most innovative federal R&D program is a truly remarkable finding, and a testament to the speed at which the fields of biotechnology, biomedical imaging and bioengineering are moving. Since patents are strongly correlated with higher levels of product development, start-up activity, and employment, patent output may be a key metric that policymakers would want to consider to optimize the economic and employment impact from publicly funded research. In the meantime, the Administration and Congress should be proud to recognize NIH as the home to one of the leading – if not the leading – jobs-producing R&D programs across the federal government. And since much of the downstream R&D spurred by NIH and NIBIB patents occurs at companies located just outside of major academic centers, cities, and districts, the Committee may want to further examine the role of patent output as a key metric for growing R&D-related jobs outside of traditional academic centers.

Taken together with the compelling public health and global leadership factors described earlier, we urge the Committee to give strong consideration to the Academy's recommended funding levels for both the NIH and the NIBIB. Doing so will allow this valuable jobs-promoting research to continue improving lives and spurring new export-oriented businesses all across the country. Thank you once again for inviting the Academy to testify today, and I would be happy to answer any questions.