HARVARD
MEDICAL SCHOOL

The Giovanni Armenise-Harvard Foundation Dean's Basic Science Grant at Harvard Medical School

Stewardship Report
October 2016

HARVARD MEDICAL SCHOOL

ARMENISE-HARVARD DEAN'S BASIC SCIENCE GRANT, 2015-2016

Overview

Since its inception, the Giovanni Armenise-Harvard Foundation has provided the Dean of Harvard Medical School with vital income from its endowment in support of the Armenise-Harvard Dean's Basic Science Grant. These generous gifts have allowed the Dean to allocate funds annually toward the School's most strategic priorities in the greatest need of supplementary funding. Because of Count Giovanni Armenise's vision and generosity in supporting Harvard Medical School, the School has continued to lead academic medical centers globally, educating future leaders while advancing science for the benefit of the world's people.

During the 2015-2016 fiscal year, $1,689,000 was made available to former Dean Jeffrey Flier through the Armenise-Harvard Dean's Basic Science Grant. At the Dean's direction, these funds were used to support continued investment in the vital new Information Technology Initiative that is already strengthening the School's capacity for innovation and excellence in research.

A Continuing Information Technology Transformation for Basic Research in Science and Medicine

Harvard Medical School is bringing to fruition a strategic vision for information technology designed to support 21st century biomedical discovery. Now into its fourth year, this landmark initiative continues to transform the School's IT environment in ways that promote speed and efficiency, increase capacity, and provide a foundation for sustainability. To support the evolving complexities of biomedical research, especially those studies requiring the use of computational approaches as well as those that generate and analyze large data sets, HMS must maintain a state-of-the-art IT enterprise. This foundational Information Technology Initiative ensures that HMS continues to advance our understanding of disease through rigorous investigation with the aim of promoting health and well-being for individuals and communities around the world.

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Recent Advances in Network Transformation, Storage Architecture, and Computational Capability

Network Transformation

Following the consolidation in FY15 of three disparate production data centers into a common location – one of the key components of this landmark multi-year project – and improvements to the School's core and campus network backbone, efforts over the course of FY16 brought to a successful conclusion the complete replacement in all HMS buildings of the network infrastructure. This critical transformation of HMS's computing architecture, which is providing researchers across the campus with significantly increased bandwidth – now ten-fold higher – for data transfer and scientific collaboration, positions the School effectively

for the continued "digitalization" of biomedical research.

In addition, IT has addressed connectivity to major collaborating institutions by implementing technology to generate "Science DMZs" that streamline the transfer of high volume data sets. As a result, a new super-fast link is now in place with the Broad Institute of Harvard and MIT, and work will soon be underway to establish a similar connection to Harvard's Faculty of Arts and Sciences computer systems. As part of these network upgrade efforts, pervasive wireless connectivity was implemented in all HMS campus buildings. In addition to immeasurable benefits for researchers, this was a critically important effort in support of the flipped classroom teaching paradigm at the heart of the School's new *Pathways* medical education program. The program relies heavily on streaming videos to medical students, something previously impossible on the aging infrastructure within HMS student housing.

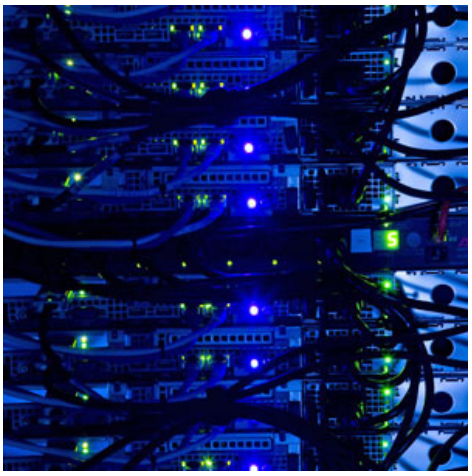
Storage Architecture

Since our last report in November 2015, IT has continued to redesign the School's scientific data architecture. Faced with an unabating demand for storage that has consistently doubled year after year, the School's investment in storage solutions has also grown, raising the issue of sustained affordability in the future. In response, IT has introduced lower-cost storage solutions that offer faculty greater choice and flexibility. Of particular note, IT recently moved the long-term storage option – allowing the transfer of data sets no longer in active use to inexpensive archive media – from pilot mode into full production. The positive results of this effort are manifest, even after a short period, in the meaningful reduction of storage requirements.

IT continues to investigate new technologies and is now piloting a promising private cloud option that should be ready for faculty use in early 2017.

Computational Capability

In addition to landmark transformations of the IT network and data storage architecture, advancement of essential computational capabilities to support the HMS research community has been at the center of this past year's efforts. In particular, IT has initiated a project to create a second-generation *Orchestra high performance computing environment* (HPC) – or O2. As you may recall, the *Orchestra* cluster is a shared HPC environment at HMS that serves a broad and diverse research community whose IT requirements and workflows are complex. Tens of thousands of projects are run on the HMS *Orchestra* cluster every day by IT engineers. These experts closely monitor the job-handling software and project configuration to ensure that data throughput is properly balanced among hundreds of HMS researchers.



High performance computing (HPC)

The new O2 will not only increase computing speed but will also afford greater flexibility to design workflow solutions uniquely tailored to new and evolving analytical techniques. Such techniques include image reconstruction (the creation of two- or three-dimensional images from scattered or incomplete data), an area of tremendous interest to the HMS research community but one whose development is limited by the current infrastructure. A multi-year program requiring significant future investment, the O2 initiative will ensure that the HMS research community has access to the most advanced computing facilities available.

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Securing sufficient financial support for critical new initiatives in their early stages, such as this Information Technology Initiative, presents an enormous challenge to Harvard Medical School. Interim

Dean Barbara McNeil and her cabinet are deeply grateful for the Armenise-Harvard Dean's Basic Science Grants, as they continue to afford the funds needed to advance strategic priorities at HMS.