



Overview

Harvard Medical School welcomes the chance to put forward the opportunity to invest in the lab of George Church, a world renown geneticist and one of our most accomplished and collaborative scientists. Your gift would be fueling leading-edge investigation and making possible extraordinary advances in biomedicine, through support of his laboratory at Harvard Medical School.

Harvard Medical School is a powerful and subtle lens through which to formulate new questions around, and envision new solutions to, the suffering caused by human disease. The School is also a catalyzing force, enacting changes that will transform the way medicine is practiced in the United States and around the world.

We are the first-ranked medical school in this country. We train tomorrow's top physicians—in major hospitals, in group and private practices, in community health centers, in resource-poor settings globally—and also prepare leaders in the academic, industrial, and policy-making sectors so critical to improving medical practice and health outcomes. We are home to a range of scientific and biomedical visionaries, of which George Church, PhD is an exemplar.

We are one of the most respected biomedical research communities in the world. Our faculty—many Nobel laureates and National Academy of Science members—are probing the fundamental questions of human biology, unlocking the complex riddles of disease mechanisms, and creating more effective models for therapeutic discovery and development.

We are the fulcrum at the center of Harvard Medicine, a vibrant community of over 10,000 faculty across our 16 outstanding teaching hospital affiliates. Our capacity to convene a community of this quality and magnitude to form research, clinical and translational alliances sets Harvard Medical School apart as a source for new solutions to the most intractable disease challenges.

We are grateful for the opportunity to share our work, our passion, and our vision with you and look forward to sharing information about Dr. Church's powerful explorations with you. We are pleased to provide you with a summary that describes Dr. Church's major endeavors at Harvard Medical School that would benefit greatly from philanthropic investment.

THE CHURCH LAB

The Church lab and its close collaborators have a powerful record of developing transformative new technologies and applications which impact a broad set of biomedical and other sciences and industries. The technologies often result in million-fold reduction in costs, enabling scientific exploration to advance at an exponential rate. Notably, these accomplishments have been achieved in large measure with the flexible funding afforded by visionary philanthropists willing to invest in high risk/high reward science.

The technologies developed by the Church lab overlap one another and synergize to enable still newer and more effective strategies. After many years of these activities, Dr. Church's group is in a unique position to continue this auto-catalytic innovation. Dr. Church and his colleagues extensively use mathematical and computational modeling, including Computer-Aided Design (CAD) to make this process rigorous, reproducible and shareable.

Recent laboratory methods that your investment will continue to fuel via this creative process could include:

- polymerase-nanopore fusions:
- in situ sequencing
- use of oligonucleotides synthesized on chips (for genetic alterations and non-biological data storage)
- super-resolution microscopy
- genome editing (via MAGE, Zn fingers, CRISPR, and recombinases)
- mammalian cloning
- developmental biology of embryos and organoids in cell culture

The applications your investment would help make possible could include analysis of personalized genomics, microbiomics, metabolomics, and other omics; development of gene therapies; engineering cells resistant to all viruses; aging reversal; humanized animals for research and organ transplants; biosensors for optimization of chemical manufacturing; and regulating complex biological circuits.

The Church lab is also exploring synthetic ecosystems including mammalian digestive systems, space biology, de-extinction, and Cas9 gene-drives for use in elimination of malaria and other vector-borne diseases. An investment in the high risk/high reward science that characterizes the Church laboratory has the potential to transform what is currently science fiction into scientific fact.

A consummate collaborator who functions as the nexus of many major projects, George Church also hopes to further explore ways of making the projects collaborative through the HMS Genetics department, HMS biomedical research community, and beyond. His group hosts the world's most open-access datasets on human biology (via personalgenomes.org) and works on novel communication strategies via pged.org

Your Investment Is Critical

In the U.S., the National Institutes of Health is now funding conservatively. In fact, funding was recently denied to several of Dr. Church's well-conceived and highly collaborative scientific projects deemed "too innovative." As myopia now permeates the governmental funding landscape, great thinkers and innovators like George Church rely on support from entrepreneurial spirits who understand that tremendous rewards come only through investments in highly innovative projects. We believe that Dr. Church is the hub of a community of Harvard Medical School geneticists and, indeed, forward thinking life scientists worldwide, who will be the source of major breakthrough discoveries into the genetic foundations of many diseases and conditions. With your support, Dr. Church will continue to transform the field of genetics and exponentially speed the pace of discovery.