"I think that over time there are two drivers of the U.S. economy other than natural resources: education and innovation. As a country, we do better at that than most places in the world. Anything I can do to help spur that kind of activity at Caltech makes perfect sense."

– Jim Rothenberg

In 2008, Jim and Anne Rothenberg generously provided funding to establish the Caltech Innovation Initiative, which offers competitive grants for early-stage research that may lead to marketable technologies for the benefit of society.

These grants spur innovation by enabling Caltech faculty to develop bold ideas and help bridge the gap between fundamental research and the practical developments required for capital investments. The initiative has seeded efforts in energy and green technologies, information technology, neuroscience, biomedicine, biotechnology, and nanomaterials. Since the program launched in 2009, it has awarded 89 grants leading to 120 U.S. patent applications.

While Jim was pleased with the initial progress, he envisioned even greater possibilities with continued investment over the long term. Toward that end, the Rothenbergs committed an additional $15 million in support of the initiative. In recognition of their extraordinary leadership, Caltech renamed the program the ROTENBERG INNOVATION INITIATIVE.

With its track record of successful strategic investment, other donors have joined the Rothenbergs in supporting this initiative, further expanding its scope and impact. Today, Caltech seeks additional partners to fuel development in technology and innovation.

"I want Caltech to be able to attract excellence, wherever excellence may be, because excellent people will get things done."

– Jim Rothenberg
Why CALTECH

Caltech’s founders were leaders in their fields who felt constrained by the prevailing conventions of other universities. They envisioned a research and educational center where academic freedom would flourish and fundamental science would lead to advanced technologies.

In the years since, Caltech’s faculty and alumni have accomplished many of the world’s most important scientific discoveries and been recognized with numerous prestigious awards for outstanding scientific and technological achievement, including 38 Nobel Prizes, 58 National Medals of Science, 13 National Medals of Technology and Innovation, 8 Kavli Prizes, 7 Crafoord Prizes, and 6 Turing Awards.

Caltech has earned its reputation as one of the world’s leading research universities. But more important, Caltech benefits society through its fundamental contributions to the progress of science. From the Big Bang to the human genome, Caltech’s scientists and engineers have illuminated the furthest reaches of human understanding and laid the foundation for others to build upon and follow.

“Scientific investigation is the spring that feeds the stream of technical progress, and if the spring dries up the stream is sure to disappear.”

— Caltech co-founder Arthur Amos Noyes
The Rothenberg Innovation Initiative Advances Improvements to Flash Memory

The prospect of modeling computers after the brain has tantalized scientists and engineers for decades. A machine with that kind of resilience, adaptability, and parallel-processing power would transform the field. To tackle the challenge, Shuki Bruck—the Gordon and Betty Moore Professor of Computation and Neural Systems and Electrical Engineering at Caltech—is creating theories and algorithms that could allow computers to retrieve data like the human brain does.

One example: FLASH MEMORY is a ubiquitous technology now inside almost every portable electronic device. But it has limitations. Information can only be written and erased a few thousand times. This is good enough for cameras or phones, but it falls short for large-scale industrial needs.

Bruck aims to change that. He has designed a method to improve the capacity, speed, and reliability of flash memory. The Rothenberg Innovation Initiative supported fundamental microbiome research in Mazmanian’s lab. Funding from the initiative further enabled essential proof-of-concept animal experiments, which then positioned the project to attract significant venture capital investment.

This momentum led to the founding of Axial Biotherapeutics, which successfully closed a $19.15 million A-round at the end of 2016. Intellectual property licensed by Axial from Caltech—coupled with ongoing collaborative work involving Mazmanian’s lab at Caltech, including sponsored research support—provides the foundation for the company’s discovery platform targeting various components of the gut-brain link to generate a diverse pipeline of new therapies for patients with CNS disorders.

“Investments in the Future
Four Rothenberg Innovation Initiative Case Studies

The Rothenberg Innovation Initiative Advances a Treatment for Autism

According to the Centers for Disease Control and Prevention, the prevalence of AUTISM SPECTRUM DISORDER (ASD) in the United States is 1 in 68 children (1 in 42 boys and 1 in 189 girls). Early diagnosis is critical for implementing behavioral therapies, so improvements in diagnostics coupled with novel therapeutics could significantly transform the treatment of ASD in the U.S. and worldwide.

Sarkis Mazmanian, the Luis B. and Nelly Soux Professor of Microbiology at Caltech, was one of the first to show a link between bacteria found in the human intestinal tract and disorders of the central nervous system (CNS) such as ASD, Parkinson’s disease, anxiety, and depression. The Rothenberg Innovation Initiative supported fundamental microbiome research in Mazmanian’s lab. Funding from the initiative further enabled essential proof-of-concept animal experiments, which then positioned the project to attract significant venture capital investment.

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“We are at an interesting time in the history of the human race; our life is dominated by information production and exchange that is global, practically instantaneous, and infinite in volume. The challenging aspect in this new reality is the retention of information for a very long time—practically eternity.”

— Shuki Bruck
CARDIOVASCULAR DISEASE (CVD) is the leading cause of death worldwide, claiming more than 17.5 million lives annually. In the United States, one in every six healthcare dollars is spent on CVD, and the Centers for Disease Control project that direct medical costs could hit $818 billion by 2030. This estimate excludes the cost of lost economic productivity, which could exceed $275 billion. Mory Gharib, Caltech’s Hans W. Liepmann Professor of Aeronautics and Bioinspired Engineering, may help change all that. His lab has developed a handheld device that connects to a smartphone and collects diagnostic data non-invasively, through images captured on the phone’s camera, for 10 percent of the cost of the invasive tests that are the current standard of care. Compared to the traditional 2D echocardiogram, the device is faster, easier to use, less invasive, cheaper, and more accurate. And because it connects to a smartphone app, the device can collect data in remote locations and transmit the results to medical experts through the cloud. Gharib’s device registers radial movement of any near-skin artery, allowing an accurate reading of arterial pulse pressure. Coupled with his novel signal processing method, this information can accurately diagnose the cardiac health of a patient. This advance has implications for more than just CVD, as cardiovascular tests are relevant for a variety of indications, such as monitoring cancer patients undergoing cardiotoxic treatments and detecting pre-diabetes in insulin-resistant patients, raising the potential impact to billions of patients.

The Rothenberg Innovation Initiative supported prototype development and several patent application filings, and in 2014 a start-up company was founded to advance commercialization. The California-based start-up Aivcena LLC has licensed the patents and is currently conducting clinical studies, with plans to pursue FDA regulatory approval.

Frances Arnold, Caltech’s Linus Pauling Professor of Chemical Engineering, Bioengineering, and Biochemistry, has made a difference that touches lives every day. She developed “directed evolution,” a process for building à la carte enzymes—the workhorses of the biological world that also have become essential for industrial chemical processes. Her technique is used in hundreds of labs as well as in renewable energy and the greener manufacturing of medicines, cosmetics, and many other consumer products. Most recently, Arnold and her team have been developing a unique, sustainable, and highly efficient way to produce MOLECULES FOR MEDICINE. Non-canonical amino acids (ncAAs) are essential building blocks for hundreds of pharmaceuticals and medical-imaging agents—but until now, synthesizing them has required an expensive, time-consuming process using toxic metals. Arnold’s method uses cheaper, more environmentally friendly components and could allow companies to create new compounds to advance this evolving field.

One year of Rothenberg Innovation Initiative funding helped Arnold’s lab expand its IP portfolio on this technology with an additional patent and a pending start-up company.

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“So it’s about education, which is from my point of view imperative for this country. It’s about innovation, which is also imperative. And it’s about being part of making Caltech a vibrant and vital place that’s important.”

– Jim Rothenberg