
BIOMEDICAL INNOVATION INITIATIVE
Stanford
MEDICINE
+ you =

Together, we have the chance to create a healthier world

Imagine if we could win the race against disease before it even starts. Instead of rushing to diagnose and treat cancer, stroke, and other conditions *after* they strike, what if we could predict and prevent them altogether? That's the bold vision of Precision Health: using all the newest innovations in biomedicine to understand how everything from the environment to our own biochemistry affects our well-being. Keeping us healthy, not just today, but for our entire lives.

Stanford Medicine is uniquely poised to make this vision a reality. With our atmosphere of interdisciplinary collaboration, and the tremendous technological and intellectual capital that surrounds us in Silicon Valley, we have an unprecedented opportunity. We can make the whole world healthier.

But there's a catch. The pace of biomedical discovery over the last 50 years has been largely fueled by federal grants. And that support is faltering. Careers are spent chasing funding instead of breakthroughs. Brilliant ideas are left unexplored. Our best and brightest are growing disillusioned, and we're in danger of losing the next generation of American scientists.

You can prevent this. You can re-ignite the passion of scientists young and old. You can ensure the pace of discovery keeps accelerating. And you can secure a brighter future—where the promise of Precision Health is fulfilled for everyone, everywhere. Please join us.

Lloyd B. Minor

◀ *Colorized scanning electron micrograph (SEM) of sensory hair cells in the cochlea of the inner ear. On the front cover: cross-section of a spheroid of brain cells that mimics a human cortex in a lab dish, by Anca Pasca, MD, courtesy of the Pasca Lab at Stanford Medicine.*

Lloyd B. Minor, MD
Carl and Elizabeth Naumann Dean
Stanford University School of Medicine

Biomedical discovery is exploding

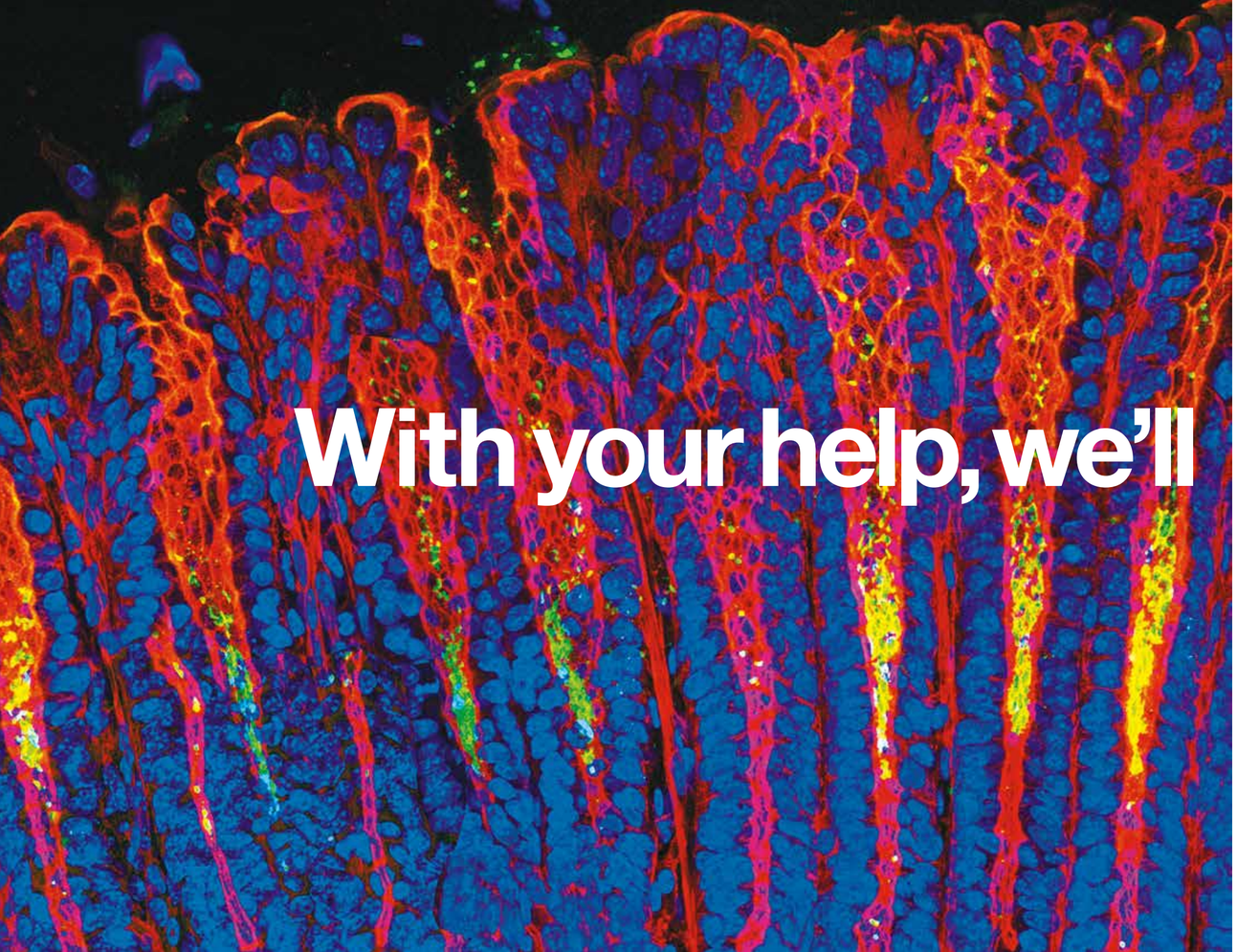
We're in the middle of a scientific revolution. Over the past two decades, biomedical knowledge has grown exponentially, giving us utterly new insights into how life works. Astonishing advances in genomics, bioinformatics, imaging, and stem cell medicine are offering up possibilities that were unimaginable just a few years ago. New tools that will allow us not only to heal disease, but to predict it and prevent it, are finally within our reach. This is more than just a revolution in science and health care—it's a revolution in the human condition.

◀ *High-resolution neural image showing how a mouse brain responds to cocaine addiction and fear. Produced using the CLARITY system developed by Karl Deisseroth, MD, PhD.*

But the spark igniting it is on the verge of going out

The innovation that fuels this revolution is in danger. National funding for biomedical research is becoming increasingly constrained and conservative. The NIH grant acceptance rate has been cut in half since 2003, and the purchasing power of dollars awarded has decreased more than 25 percent. Today, it's the safe and predictable projects that survive. Proven results are often expected up front, and novel approaches are often rejected out of hand. Brilliant scientists are spending more time writing grant proposals than conducting research. And as the next generation looks on, they're growing more and more disillusioned. If we don't act now, this blaze of discovery will dwindle, and the brightest hopes of this revolution will be extinguished.

◀ *Epithelial cells in the process of adhering to one another, courtesy of the Nelson Lab at Stanford Medicine.*



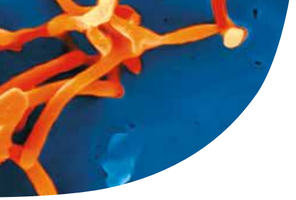
With your help, we'll

flames the fan

The Stanford Biomedical Innovation Initiative is a philanthropic effort designed to ignite innovation in today's challenging climate. Strategically targeting three vital areas of need, its flexible funding will power a simple concept that is the foundation of Stanford Medicine's extraordinary success: when you set the best minds free to explore to the limits of their talent and imagination, they'll deliver a brighter, better future.

1. **Empowering students** with four years of independent funding so they can follow their scientific passions
2. **Unleashing genius** with endowments for both senior and junior faculty
3. **Inspiring curiosity** with competitive seed grants for the most innovative, out-of-the-box research ideas

◀ Helicobacter pylori *bacteria (in green) colonizing deep in the gastric glands, courtesy of the Amieva Lab at Stanford Medicine.*



independent funding for the first 4 years of bioscience graduate school

The future of human health rests on the shoulders of these voraciously curious young people. They're the ones who'll discover the cures of tomorrow, yet at most institutions, their potential is limited because they must piggyback on their advisors' grants for financial support. Which means they spend most of their time and energy working on other people's projects in scientific fields that may not excite them. Rather than following their passions to discover where they can make the greatest impact, they're forced to follow the funding.

That's why this initiative guarantees independent funding for all Stanford biosciences PhD students for the first four years of their graduate education. Released from dependence on their advisors' grants, each will have the freedom to pursue his or her own ideas. Word has spread about this innovative new program, and more and more of the brightest young scientists are choosing Stanford for their graduate education. Our goal is to sustain this funding for 10 years, which will have a profound effect on more than a thousand students.

Help us create a bold new generation of scientists with the courage to fully leverage all that this new era of discovery has to offer. As these young scientists go out into the world, they'll take the intellectual independence and entrepreneurial fire they gained at Stanford with them, and the impact of their achievements will resonate around the globe. With your philanthropic investment, we'll not only ensure the best keep coming here, we'll show the world how to educate scientists who have the confidence to change the human condition.

empower students

I'm re-engineering Ebola and HIV to attack cancer cells

Independent funding gave me the confidence to choose a career path where I felt I could make the biggest impact. I was able to take a risk and join a "start-up" lab without worrying about whether or not it could fund me.

I wanted to work with Dr. Peter Kim, a professor who really inspires me. He's a phenomenal protein engineer and biochemist. I love the way he approaches problems and encourages students to ask big questions. So when my first-year rotation was over and it was time to pick a lab, I chose his.

Now I'm doing my own really exciting research. It's focused on re-engineering viruses like Ebola and HIV to target specific cell types. The goal is to be able to reduce the toxicity of chemotherapy drugs by selectively infecting cancerous cells and not healthy cells. It's awesome to imagine the pain and suffering we could prevent.

It makes me really uncomfortable to hear that independent funding is in danger. Without it, new labs won't be able to take on new people, and grad students like me will miss out on the opportunity to pursue the science we're most passionate about.

◀ *Colorized scanning electron micrograph (SEM) of Ebola, courtesy of the National Institute of Allergy and Infectious Diseases.*

Clayton Laroy Brown
Biochemistry Graduate Student

genius

endowments for some of the world's most accomplished scientists

Our faculty are all giants in their fields. The seven Nobel laureates and hundreds of other innovators on our faculty have the highest per-capita federal funding rate of any academic medical center in the nation. But NIH dollars are unpredictable and can only be used in very specific ways on preapproved projects. That's why we need endowments for our faculty. Endowments provide the creative freedom, stability, and institutional endorsement that the world's finest scientific minds deserve—and can command elsewhere.

Endowments supply guaranteed funding faculty members can use at their discretion to take risks, explore exciting new ideas, and establish proofs-of-concept they can leverage to obtain more funding. But Stanford has relatively few faculty endowments compared to other top medical schools. We have many more deserving faculty than we have endowments to award, so this philanthropic initiative aims to create 30 new endowments to give our faculty the freedom to innovate to their full potential.

20 endowed professorships will be created by this initiative and awarded to outstanding senior faculty. The highest honor a university can bestow on faculty, endowed professorships enable scientists to pursue disruptive, high-risk, high-reward ideas.

10 endowed scholarships will also be established to empower younger faculty at a critical time in their careers—when they're at the peak of their productivity and creativity—but not yet considered safe bets for NIH funding.

unleash

I'm working to fix a mutation that can contribute to diseases like diabetes and Parkinson's

My life's work—and my lab's work—is translating fundamental discoveries into new therapeutics. But until just a few years ago, this kind of translational research was considered non-academic work that should be handled by industry. Nobody wanted to support it.

That all changed in 2006 when I was honored with Stanford's first endowed professorship in translational medicine. It's been a real validation of my work, and the discretionary funding it generates has given me the freedom to tackle problems no one else is thinking about—like the fact that more than 500 million people have a genetic mutation that causes a serious enzyme deficiency. Until recently, the mutation was thought to be benign, but we now know it can contribute to many life-threatening conditions, including esophageal cancer and diabetes. It can also play a role in common neurological diseases like Parkinson's and rare pediatric illnesses like Fanconi anemia.

There's been absolutely no effort to develop a drug to correct it—until now. By leveraging these funds and being able to use them how we needed to, we found a small molecule that fixes the problem. We generated proof-of-concept to get more funding from the NIH and to progress to clinical trials.

There's also been a ripple effect. Thanks to the research tools we developed with these funds, our once-tiny field now has its own international conference! None of this would have been possible without my endowed professorship.

◀ *Colorized scanning electron micrograph (SEM) of mitochondria (blue) in a pancreatic acinar cell. The mutation Dr. Mochly-Rosen's team is working to correct causes a deficiency in an enzyme that protects these vital organelles, which are the metabolic engines that power every cell in our bodies.*

Daria Mochly-Rosen, PhD
The George D. Smith Professor of Translational Medicine

inspire curiosity

competitive **seed grants** for the most innovative ideas

Innovation Awards are designed to stimulate the most creative, out-of-the-box research ideas and provide funding for faculty to pursue entirely new avenues of inquiry without knowing where they might lead. These kinds of high-risk, high-reward projects have the most potential to transform human health, but it's nearly impossible to pursue them in today's funding climate because they're passed over for safe, incremental research.

These awards are competitive seed grants to fuel "shoot-for-the-moon" ideas that don't yet have the preliminary data needed to receive federal grants. With them, faculty can leverage the results to move into new fields and generate enough data to garner stable federal funding. Expendable philanthropic gifts will enable us to award more than 300 of these modest seed grants over the next 10 years to fuel disruptive research projects in two categories:

Discovery Awards will ignite curiosity-driven basic research on the fundamental mechanics of life and are available to all faculty members in Stanford's 11 basic science departments.

Translational & Clinical Awards will stimulate inter-disciplinary "bench-to-bedside" research to move basic science discoveries from the lab into the clinic. They are available to all School of Medicine faculty.

I'm studying bird brains to help kids who have problems controlling attention

My team and I applied for a Discovery Award because we were frustrated after five painful years of rejection from federal funding agencies. We had devised a completely new method for exploring the root causes of psychiatric disorders associated with the inability to control attention, like schizophrenia, autism, and ADHD, but we didn't have a track record in those particular fields.

This new method allows us to study how neurons in different parts of a chicken's brain work together to control where a bird looks and how it pays attention to what it sees. We knew if we could prove that the new method worked, the results would inform future experiments with mammals, which could lead to an understanding of what goes awry in humans afflicted with these devastating psychiatric disorders.

After the faculty committee reviewed our proposal, we received a two-year $180,200 grant. In less than a year we had generated enough data to earn a prestigious $1.2 million, five-year NIH grant to take our research to the next level. If it weren't for our Discovery Award, we never could have pursued this promising new approach.

◀ *An image from Knudsen's lab of networks of neurons in the optic tectum of a young chick, an area of the brain that helps control vision and attention.*

Eric Knudsen, PhD
Edward C. and Amy H. Sewall Professor in the School of Medicine and Professor of Neurobiology

You can have an explosive impact

You could turn an innovative idea into a Nobel Prize by funding seed grants. You could give a brilliant researcher the freedom to find a cure for Alzheimer's by establishing a faculty endowment. You could give a young scientist the confidence to change the world by assuring independent funding. Your support can make a profound difference not just to science, but to patients everywhere. Together, we'll make sure the full potential of this revolution is realized. We'll finally have the power to stop even the most devastating diseases long before they can hurt you and those you love. And we'll create a whole new generation of scientists with the skills and the spirit to make the world a healthier place. Everyone has a reason to care about this initiative and anyone with a passion for discovery can have a real impact. Please join us.

◀ *Detailed 3D model of a ß2 adrenergic receptor (blue) with its coupled G-proteins (red and orange). The first time a G-protein-coupled receptor (GPCR) has ever been captured in action, this image earned Brian Kobilka, MD and his colleagues the 2012 Nobel Prize in Chemistry. GPCRs are the largest class of cellular receptors, and nearly half of all drugs target them.*

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