Freedom, Creativity, and Innovation:

The Packard Fellowship Case Study

"All the progress made in the 20th Century was based on science done in the 19th century."
-David Packard

When, in 1988, David Packard first conceived of what would become the Packard Fellowships for Science and Engineering, his legacy was already secure as the co-founder of one of Silicon Valley's greatest technology success stories. But the turbulent events of the previous year, which had seen the passing of his wife Lucile and his own hospitalization, did not leave Packard content to rest upon his laurels. Instead, his abiding passion for scientific research, which he had always celebrated as the basis for his own success, spurred him to launch yet another transformative program.

David and Lucile Packard

Photo Courtesy: The David and Lucile Packard Foundation

What Packard and his colleagues created was a new type of fellowship, aimed at early-career researchers. In contrast to the then-prevailing model of restrictive research fellowships, the Packard Fellowships were designed to offer Fellows a freedom that could spark fearless, creative ideas among its recipients. This model has stood the test of time like few other philanthropic initiatives, and to this day, three decades since they launched, the Packard Fellowships have continued to act as a catalyst for scientific and engineering discovery.

"[My father] very often said all of the progress made in the twentieth century was based on science of the nineteenth century," said Susan Packard Orr, David Packard's daughter and past board chair of the Foundation. "He really understood at a very deep level and believed that to make progress as a society and as a nation and as a world, we really needed to focus on advancing science and engineering both."

Packard's first step was to find out more. He appointed then-foundation director Cole Wilbur and Lynn Orr, a professor of engineering at Stanford University, as well as Packard's son-in-law, to do some research. Packard wanted to know how philanthropy could best support young scientists and engineers.

"He just thought it made sense to try to invest in the most talented young folks that we could find, in the belief that that would lead to lots of productive research," said Lynn Orr, who remains on the Advisory Panel

for the Fellowships to this day. The theory was that this approach would maximize the scientific return on investment by freeing researchers from some of the burdens of hunting for funding during their most productive years, and that the benefits would also flow down to students who came through these research groups.

Wilbur and Orr met with a number of foundations in the U.S. that gave fellowship grants, including the Alfred P. Sloan Foundation, the MacArthur Foundation, and the Pew Charitable Trusts. They also met with many research institutions. They learned that there was opportunity for creative discovery in a broad range of scientific and engineering fields, but that there was insufficient support for early-career research faculty, who had a hard time getting funding from federal government agencies. What funding existed was often restrictive and was tied to the idea that was proposed, even if the idea was not working. Available funding also tended to be short-term, which meant the scientists were still spending significant time writing grant proposals rather than doing research.

Wilbur and Orr brought their findings back to Los Altos, confirming for Packard that there was a need for the kind of program he envisioned.

Designing the Fellowship Program

Packard and the Foundation staff wanted the Fellowships to spur the creative pursuit of science by providing the nation's most promising early-career scientists and engineers with flexible funding and the freedom to take risks and explore new frontiers in their fields of study.

To encourage creativity, the Packard Fellowships would be extremely generous, especially by the standards of the day. Fellows would receive $100,000 a year for five years of funding (the amount has since risen to $175,000 a year), sufficient for the Fellows to pursue bold ideas. There would be few restrictions on how the funds could be used— Fellows could use the funding for equipment, travel to conferences, childcare, or whatever else they needed to be able to pursue their research. Reporting requirements would be minimal — just a one or two-page narrative report every year — so as not to overly burden or distract the Fellows from their research. Universities would also be required to submit a financial report of the Fellow's expenditures annually.

Selecting the Fellows

Designing a process to identify the Fellowship nominees was the next challenge. The Packard team wanted to find the brightest, most talented early-career scientists and engineers who had bold and innovative ideas for their research.

"Disciplines included physics, chemistry, mathematics, biology, astronomy, computer science, earth science, ocean science, and all branches of engineering."

After much discussion, the team decided on a multi-stage process that remains essentially the same to this day. First, the Foundation would invite 50 of the top U.S. research universities to each nominate two Fellows. The nominees would be within the first three years of their faculty careers and eligible to serve as principal investigators in the natural and physical sciences or engineering. Disciplines included physics, chemistry, mathematics, biology, astronomy, computer science, earth science, ocean science, and all branches of engineering. Areas of science and engineering that already had access to relatively generous funding (such as clinical research, research associated with the design and construction of large national facilities, and applied research related to national security) would not be considered.

The required application materials included a nomination form from the president of the invited university, a C.V. and publications list for the nominee, and a one to two-page research statement describing why the research was important, general goals, and how the funds would be used. Letters of recommendation for each nominee would also be required. The proposal guidelines were intended to be informative, but not to be onerous for the nominee.

The nomination packages would then be forwarded to an Advisory Panel made up of 12 internationally recognized scientists and engineers for their review, and the panel would meet in person to recommend candidates to the Foundation's Board of Trustees.

The Foundation hoped that this process would attract the very best candidates for the Fellowship, and indeed it has, from the start, produced an outstanding pool of applicants, of the most brilliant and creative young researchers in the country. This leaves the panel with the humbling task of being forced to separate out the very best of the best as Fellows.

"We are getting the cream of the crop when we get those 100 nominations," said Xiao-Wei Wang, the Packard Fellows program manager at the Foundation. "The Foundation and the Advisory Panel ultimately want to take risks, to take a leap of faith that the individuals' research will take off, and that the Fellowship award will help attract additional support."

The First Fellowships

The first Packard Fellowships for Science and Engineering was launched in October of 1988, with an announcement that 20 Fellows would receive a combined total of $10 million.

David Packard with Fellows at the 1989 Inaugural Packard Fellows Meeting

Photo Courtesy: The David and Lucile Packard Foundation

The first Fellows worked in fields ranging from mathematics to theoretical astrophysics to biology and chemistry, and they worked at universities that included both Ivy League institutions, such as Columbia and Princeton, and public state universities, such as the University of Minnesota and Penn State University. Only four were women, but one – materials scientist Martha Mecartney – promptly set an important precedent when she used a portion of her Packard funding for child care, reinforcing the tenet that Fellowship money was truly flexible and good for any use that would aid an investigator's work.

The Packard Fellowships quickly proved to be a huge boost to the scientists who received them, allowing them to pursue bold and imaginative ideas. Frances Arnold, a chemical engineer and 1989 Packard fellow, said, "The Fellowship program was unique – the mix of engineering and science, the generous support, and the flexibility it offered did not exist with other fellowship programs, and it allowed me to pursue riskier research."

"I made the audacious claim in my Packard Fellowship application that I was going to direct the evolution of proteins to do non-natural things," she continued. "It was a crazy idea, but the Fellowship allowed me to do that research. That work became the underpinnings of my whole career, in fact a whole field of science. There are now hundreds of laboratories that do this work." Arnold, who would go on to chair the Packard Fellowship's own Advisory Panel, received a Nobel Prize in 2018 for her pioneering work in the directed evolution of enzymes, which began with the support of the Packard Fellowship.

Building a Community

The idea of a meeting or conference came up during the first year of the Fellowships. Packard immediately agreed, eager to meet the Fellows whose talent and bold ideas had captivated him and his team. All the Fellows were invited the Monterey Bay Aquarium, an institution which the Foundation and the Packard family had played key roles in launching, for three days of research presentations and discussions.

2018 Packard Fellows Meeting and 30th Anniversary

Photo Courtesy: The David and Lucile Packard Foundation

The meeting was a hit with both Foundation staff and the Fellows, so much so that it became one of the highlights of the annual Packard Foundation calendar. Today, current Fellows and their families are invited annually to each Fellows Meeting over the duration of their Fellowship (five years). Those completing their first year and last year give presentations, while the others present in a poster session.

Packard looked forward to each of these meetings, sitting up front every year to better soak up the presentations and listening intently to each presentation. He never missed a meeting.

"David Packard would come to the Fellowship's meeting, he'd sit down in the first or second row, and he was a little hard of hearing, and so he had a little device that he could kind of hold out and it would pick up the vibrations, and so he would sit there holding this, and he'd listen very intently, and take down notes," recalls Cole Wilbur, the Foundation's former long-time president.

The Fellows also found the meetings rewarding. They heard about cutting-edge research in fields unrelated to theirs, which encouraged them to think about their own work in new ways and built lasting relationships and collaborations.

"This is a really special group of individuals that cross different disciplines, generations, and backgrounds," said Wang. "Packard Fellows get to know one another on a personal level. Their kids get to know each other, and their spouses get to know each other. When you establish that level of trust, it inspires and sustains collaborations that might not otherwise happen."

"Packard looked forward to each of these meetings... listening intently to each presentation. He never missed a meeting."

"It's really a unique opportunity to talk with scientists in different fields, and those discussions are more than just two-minute quick chats," said Brice Menard, a 2014 Packard Fellow who, with 2014 Fellow Ved Lekic, became the first Fellows to collaborate for their fifth-year presentation. "We can really try to understand what they do, and we can explain what we do, and I think that's how many things started."

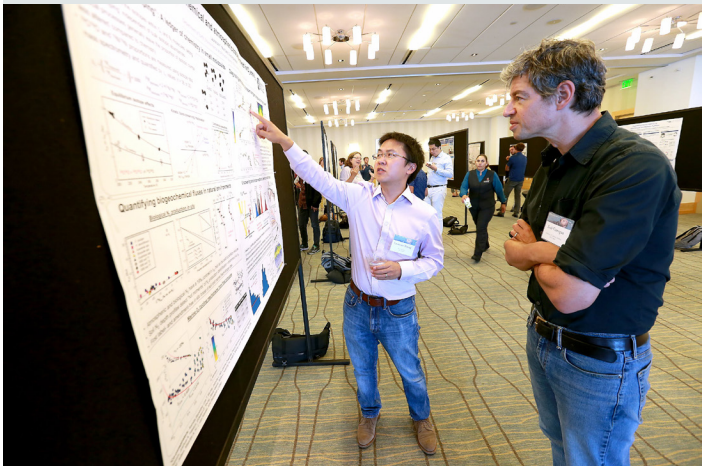
As Frances Arnold said, "In my work, I was trying to put new fields together — in computer science, engineering, biology, chemistry — and the Fellowship meetings introduced me to some of the cutting edge ideas in these fields and to see some of the new methodologies that I could incorporate into my own research."

Looking Back

Now more than 30 years old, the Packard Fellowships for Science and Engineering is a rare program that has stood the test of time, and it has remained much as it was at its founding. The Foundation considered at one point expanding the number of Fellows, but ultimately decided this change would not only put a greater burden on the Advisory Panel and Foundation staff but would also change the close-knit dynamic of the existing classes, which the Foundation wanted to preserve. To this day, the size of each class of Fellows is capped at 24, with the number fluctuating slightly from year to year.

2019 Packard Fellows Meeting

Photo Courtesy: The David and Lucile Packard Foundation



The Advisory Panel has experienced some evolutions. As whole new fields of study, such as gene sequencing and nanotechnology, have come into being, the panel has brought in new members with the appropriate expertise. The Advisory Panel has also taken advantage of another resource that did not exist when the program was founded, namely Packard Fellowship alumni who have become eminent in their fields, some of whom have come back to join the panel. Today, with the exception of Lynn Orr, the entire Advisory Panel is made up of former Fellows.

Since inception, the Fellowship has now supported more than 600 scientists from 54 universities, providing them with a total of $429 million in support. Many of these Fellows have gone on to win the highest accolades in their fields, including the Nobel Prize, the Fields Medal, the Alan T. Waterman Award, MacArthur Fellowships, the Lemelson Prize, and the Lasker Awards. Many more have been recognized for their work by election to The National Academies of Sciences, Engineering, and Medicine, with several Fellows becoming members of all three. Their discoveries include CRISPR gene-editing technology, an understanding of how Ebola works (which allowed scientists and doctors to eventually corral the epidemic), capturing the first ever fMRIs of babies' brains to unlock how different parts of the brain develop and adapt, the first achievement of Bose-Einstein condensation of atoms (thus proving S. N. Bose and Albert Einstein's theories and creating a new branch of atomic physics), and proofs of the elusive mathematical puzzle known as the twin prime conjecture, among many others.

Konstantin Batygin, a planetary astrophysicist at the California Institute of Technology and 2017 Fellow, noted, "The Packard Fellowship has allowed me to pursue problems without worrying at all about whether they're going to succeed, whether they're going to work out, or what others will think about it. I just do it because it's interesting. Having that intellectual freedom is absolutely crucial to making progress."
Chemist and materials scientist Teri Odom from Northwestern University, a 2003 Fellow, noted, "The Packard Fellowship is a model for what other types of foundations can be doing. The investment at the beginning stages allows a different type of science to come out. You incorporate crazy ideas, and you think about big things you might never have done earlier."

The Fellowship was also one of the Foundation's programs that lived closest to David Packard's heart, and his family and staff remember the satisfaction and joy he took from the program.

"He loved meeting [the Fellows] and getting to talk with them and trying to figure out what it was that they thought they could be doing and what they felt the changes were going to be twenty years down the line because of what they were doing," recalled Wilbur.

"Since inception, the Fellowship has now supported more than 600 scientists from 54 universities, providing them with a total of $429 million in support."

David Packard hoped the Fellowship would continue indefinitely, which means that much of his legacy, and that of the Fellowship he created, lies in the future.

"At the Packard Foundation, we believe that every sector of society — from philanthropy to academia to government — has a crucial role to play in supporting science and research," said David Orr, Chair of the Packard Foundation Board of Trustees. "Over the past three decades, the Fellowship program has been an example of our deep commitment to basic research in science and engineering. Every year, I love learning from the Fellows about their sometimes unexpected, but always fascinating, research — much of which would be difficult or impossible to perform with funds from traditional grants."

As David Packard himself observed, it may not be until the next century that we fully understand the fruits of that research. Hopefully, when that time comes, the Packard Fellowship will still be going strong.

SCIENCE
PHILANTHROPY
ALLIANCE

sciphil.org

twitter.com/sciphilorg
facebook.com/sciphil.org

650-338-1200
info@sciphil.org

480 California Avenue #304
Palo Alto, CA 94306

SCIENCE
PHILANTHROPY ALLIANCE

Advancing basic science—The foundation of our future