Scientists Who Fund Themselves

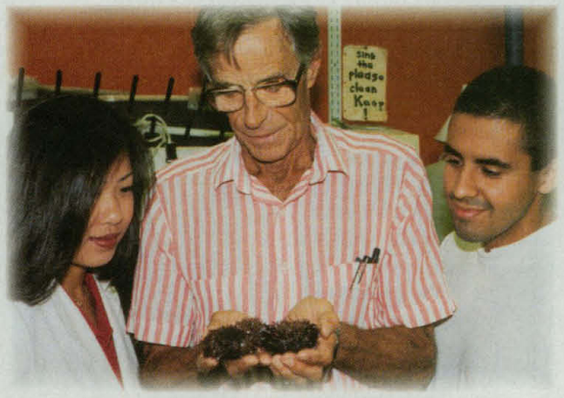
Even in today's world of multibillion-dollar grant programs, a few researchers fund some of their own work—sometimes out of necessity, sometimes for the pleasure of avoiding the hassles of grantsmanship

Tired of writing, rewriting, and resubmitting grant proposals—and then seeing your university take a huge cut when you finally get funded? Fed up with spending the bulk of your time raising money for your research instead of running your lab? Take heart from one well-known California chemist: There may be a way out. But it's not for everyone.

Fifteen years ago, this researcher, then in his late 40s, considered dropping out of science. "I was always well funded," says the researcher, who asked that his name not be used. "I just disliked the process very much. It finally reached the point, sort of my midlife crisis, where I realized I was spending 60 hours a week in the lab, and spending less than 15 doing what I wanted to do." Then he slyly grins as he tells the story of how he escaped from the grind that has become modern science: He decided to use his modest savings to play stock markets around the world. Now, he runs a sprawling lab at a major research university, and he funds most of the work himself. He no longer engages in what he calls the "lie" of the granting process. "I do science because I enjoy doing science ... I don't want to be forced to justify what I'm doing because it makes better air in submarines, or whatever," he says.

Paying your own way may sound like an extreme way to avoid the hassles of grantsmanship, but a surprising number of scientists dip into their own resources to fund at least part of their research. For some, family wealth provides a measure of freedom; others channel consulting income into their labs; and some use part of their salaries, pensions, and other personal income to pay for their science. A few pay their entire way, but most kick in funds to keep their labs going between grants or to fund unorthodox ideas or areas of research that have gone out of scientific fashion. "There are a lot of investigators out there who dig into their own pockets," says John Morrill, a self-funded developmental biologist at the New College of the University of South Florida in Sarasota. Robert Summers of the State University of New York (SUNY), Buffalo, a collaborator of Morrill's who also taps his own funds to pay for his experiments, suggests that shrinking research dollars are making the practice more common. "I think more and more people are eating more and more of the expenses of their research," he says.

Still, self-funding remains relatively rare, and it isn't even an option for researchers in some fields: It's hard to pay your own way if your research requires a $500 million spacecraft, for example. And there are downsides to the practice for those who can afford it. "You certainly don't want anyone to know you're doing this," laughs Mimi Koehl, a marine biologist at the University of California, Berkeley, who has always funded some of her own work, and has recently been using money she won from a MacArthur "genius" award. "You sound like you're a failure if you don't have a major grant for research you're doing."



NEW COLLEGE/USF

ALAN STONEBRAKER

Generous environment. John Morrill *(above)* helps support his lab and students at the University of South Florida with money he earns as an environmental consultant; Robert Summers of SUNY Buffalo *(right)* uses his own funds to supplement grants to study the developmental biology of sea urchins.

Some wealthy researchers, like the California chemist, shy away from publicity because they do not want to advertise that they have fat bank accounts. Still others do not want to remind their universities that they are not bringing in the precious dollars for overhead that come with grants. And the freedom bought with self-funding carries a hidden price: It bypasses the critical peer review of ideas that is built into the traditional granting process.

Over the past few months, *Science* has sought out this small fraction of scientists who pay their own way for a glimpse of what life is like outside the traditional granting structure. They are a diverse lot. Some are angry that they are driven to self-funding as a last resort. Others share a giddy enthusiasm for conducting experiments on their own terms and revel in the joy of sidestepping the time-gobbling, logic-defying, dignity-draining grantsmanship process. To a person, they have interesting tales to tell about why they have financed their own research, the freedom it has bought them, and the limitations of this iconoclastic work style.

Grantimosity

Self-funded investigators were a common breed before World War II, when government funding for scientific research began to soar. Not only were grants relatively easy to win in the postwar years, but the cost of doing many types of science also began to skyrocket beyond the budgets of all but the wealthiest researchers. Receiving a peer-reviewed grant also became a sign of success. But recently, as budget crunches have put the squeeze on science funding, disdain for the process has grown. "The peer-review system works very, very well in times of plenty," says Summers. "But I have a hard time believing that the science done by 80% to 90% of my colleagues is not worth funding."

This frustration and animosity toward the system is key to understanding what leads many researchers to use their own money for chemicals, a plane ticket to a field site, or a technician's salary. "The grant business has been the tail that wags the dog," says Steven Vogel, a self-funded Duke University researcher who studies biological fluid mechanics. "[Self-funding] is the path of least resistance. How do you maximize the science you want to do in the time you have to do it?"

As with many self-funded researchers, Summers is not wealthy and would rather win grants than spend his own money. But about 10 years ago, he started dipping into his cookie jar to help pay for his research. "I just realized that if I wanted to continue,

'Gentlemen of Science'

When modern science began taking shape in the 17th century, it was largely a hobby of the rich, the so-called natural philosophers or "gentlemen of science." Although many of them had patrons in the form of individuals, scientific societies, or museums, some used their own money to fund their investigations. "Aristocrats funded their own research the same way they funded their art, their estates, and their horses," explains science historian Arnold Thackeray, president of the Chemical Heritage Society in Philadelphia, Pennsylvania, and co-author of *Gentlemen of Science*. "An interest in science was no different from any other art. You were exactly an artist. The thing that's extraordinary is that the state has taken on support of science, and it's still an aberration. The sciences are the anomalous art."

Aristocrats of science. Henry Cavendish *(below)*, son of the Duke of Devonshire, and Robert Boyle, son of the first Earl of Cork, made key discoveries using family wealth.

(LEFT) STOCK MONTAGE INC. (RIGHT) THE OTHMER LIBRARY OF THE CHEMICAL HERITAGE FOUNDATION

For many years, some of the most prominent scientists of the day had links to royalty—and the money that came with the title. One prominent self-funder of the 17th century was Robert Boyle, the son of the first Earl of Cork, whose studies of the behavior of gases led to a law that still wins a spot in every undergraduate chemistry textbook. Another was the 18th century chemist and physicist Henry Cavendish, son of the Duke of Devonshire, who made a long list of discoveries, including the properties of hydrogen and carbon dioxide in water. In the 19th century, astronomer Lord Oxmantown, the third Earl of Ross, financed a telescope that Thackeray says was "the wonder of his day."

The list of famous, self-funded researchers of yore certainly is not limited to royalty. In France, the 18th century chemist Antoine Lavoisier paid for his work with money he made from a tax-collecting firm. (He also married a company executive's daughter.) In 18th century England, William Withering of digitalis fame and Edward Jenner, father of the smallpox vaccine, also supported their own research. "A lot of research was done by doctors [through] income from their practice," says Charles Rosenberg, a science historian at the University of Pennsylvania in Philadelphia. "The amounts of money involved were so small."

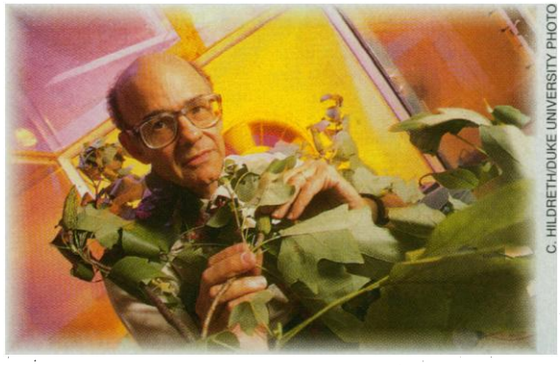
In the first half of the 20th century, some entire fields were largely funded by scientists themselves. "In the old days, most of the oceanography would be done by people who owned yachts and needed something to do," says Walter Munk, a preeminent physical oceanographer at the Scripps Institution of Oceanography in La Jolla, California. "It used to be very, very common in my field." One of the most famous examples of a self-funded oceanographer was Prince Albert I of Monaco, who in 1910 opened the still-standing Oceanographic Museum there.

Self-funded amateur scientists also made important contributions in the first half of this century. Amateur physicist Alfred Loomis, a lawyer who made millions with a company that supplied power to the entire East Coast of the United States, ran a top-notch laboratory of his own in Tuxedo Park, New York. "He was a very, very serious scientist," says his grandson, William Loomis, a researcher himself at the University of California, San Diego. The senior Loomis went on to the Massachusetts Institute of Technology, where he headed the Radiation Laboratory, which made major discoveries in radar and microwave technologies during World War II. Says Loomis's grandson: "He liked being called an amateur in the old-fashioned sense of the word—*amator*, a lover of science." –J.C.

I'd have to beg, borrow, steal, and scrape—and spend my own money," says Summers, who estimates he shelled out $10,000 on his research last year alone.

Summers, who studies the developmental biology of sea urchins and other invertebrates—and currently has two grants—says he spent 6 months working on the last grant application he sent to the National Science Foundation (NSF), and it was rejected. "Instead of fighting it and resubmitting, resubmitting, resubmitting, I have a personal policy: I won't resubmit anything," says Summers. "But I'm not going to be counted out. I take so much pleasure from my research. It's the most gratifying part of my career."

Harry Greene, a Berkeley zoologist who investigates the behavioral ecology of snakes, ran into similar problems winning grants from NSF about 15 years ago. The reason, he says, is that whole-organism biology is no longer in favor. "I'd submit a proposal to the panel that came closest to my subareas, and I'd get worse and worse reviews," says Greene, who specializes in rattlesnakes. "Meantime, I'm doing research out of my pocket." He says he has since spent "a fair amount of money on radio transmitters and gas and plane tickets." Greene says he doesn't regret having funded his own work. Still, he says, "I do resent the fact that I can't get funding. My research is relatively cheap and profoundly important."



C. HILDRETH/DUKE UNIVERSITY PHOTO

Manageable bill. Duke University's Steven Vogel uses his salary to fund his relatively inexpensive research on biological fluid mechanics.

Berkeley's Koehl, who studies the physics of how organisms interact with the fluids around them, says interdisciplinary work like this often "falls between

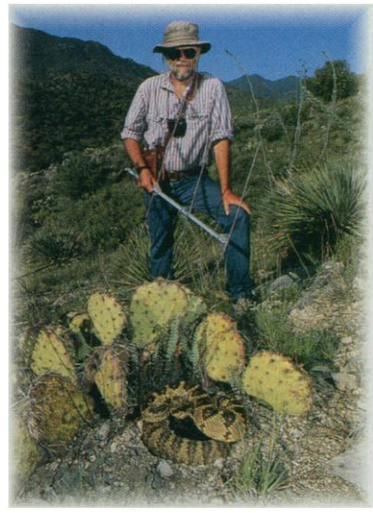
the cracks" of what funding agencies support: "If your work does not match the mission of any study sections at a granting agency, then you are out of luck." Koehl began to fund some of her own work in the 1970s, when she was starting her postdoctoral studies on the physical mechanisms that organisms use to filter things out of water. "I was hopelessly naïve about how to get grants when I got out of grad school," she says. Not knowing how to sell a proposal on that subject, she used her savings account. Later, as an assistant professor, Koehl continued funding herself. "For several years, I used my salary to fund my work and lived like a student," she says. "Two things drove me: I wanted to succeed, and I was really curious about things."

Koehl has received many grants over the years and, she notes, has benefited greatly from the equipment freely available to her at Berkeley. But she still pays for some of her own work with money from the MacArthur award she won in 1990. "I use that money to fund more innovative or exploratory studies," says Koehl.

Biophysicist Arthur Winfree, another MacArthur fellow, also started paying some of his own research costs when he was a postdoc. Although he says he has been "lavishly funded" over his entire career, he has had a hard time getting support for research that runs counter to prevailing trends, such as his recent focus on sudden death from heart attacks. "I've wanted to pursue things I can't get funding for," says Winfree. "I've tried to run against the grain of well-established thought in physiology." Specifically, Winfree is attempting to use his knowledge of how waves of color move through chemically excitable media to understand the corresponding electrical waves in heart muscles, which are responsible for sudden death.

Winfree started a consulting company in 1980—the Institute for Natural Philosophy, a name that nods to 19th century science—so he could become independent of the grant system. "I thought I'd better find out how to survive on my own," says Winfree. The institute had pulled in $70,000 for his research by the time he closed it down in 1988. (He won a $200,000 MacArthur award in 1984, invested it all, and holds it in reserve against a rainy day.)

Just as working in an obscure field or positing hypotheses that go against dogma will make winning grants more of a challenge, so will growing older and not adopting sexy new techniques. "I was essentially forced to start funding myself about a year ago," says Lionel Jaffe of Massachusetts's Woods Hole Oceanographic Institution, who studies embryo development. "The problem is, almost everybody is interested in molecular genetics. Very, very few are interested in physiology, and I know it's just as important as molecular genetics. It means I'm very much alone, and it's very difficult to get funding." Jaffe, 70, is none too pleased by the situation. "These are the worst times I've encountered in 50 years," he says. "I have a postdoc and one tech I'm supporting through my own funds. It is difficult. I am not a wealthy man. But there didn't seem to be any alternative."



Eschewing the grants snakepit. UC Berkeley's Harry Greene is funding some of his research on the behavioral ecology of rattlesnakes because support for whole-organism biology from traditional funding agencies is scarce.

MICHAEL AND PATRICIA FOGDEN IN *SNAKES: THE EVOLUTION OF MYSTERY IN NATURE*, UC PRESS (1997)

A point stressed by Greene, Koehl, Summers, and several other self-funders is that experimental science is not always exorbitantly expensive. The studies into biological fluid mechanics of Duke's Vogel, who funds all his own work, dramatically make this point. "If I had $1000 a year to spend on research, I'd be in clover," says Vogel. "I ask questions like, How do leaves on trees respond to wind? My expenses can be two rolls of film." Vogel adds, however, that because he doesn't get grants, he also does not get a summer salary, which he says could boost his income by as much as $20,000 a year. Says Vogel: "In that context, those of us who have decided not to get into the funding game have done so with some sacrifice."

CLIFFORD R. CLEMENS

Built his own institute. British Nobelist Peter Mitchell inherited money from his family's construction business and used it to fund not only his own work but that of a half-dozen other researchers as well.

Sharing the wealth

For some fortunate researchers, self-funding isn't a matter of scraping together a few dollars from pensions and savings accounts. Some of the most ambitious—and most accomplished—self-funded researchers in modern times have had the luxury of being born into wealthy families.

The United Kingdom's Peter Mitchell, a Nobelist who rewrote the book on oxidative phosphorylation, inherited money from his family's lucrative construction business and used it to fund not only his own work but that of a half-dozen other researchers as well. Mitchell, who died in 1992, even went so far as to convert an old mansion in Cornwall, Glynn House, into a research institute. "I think he would have found it difficult to have gotten funding because his ideas were rather radical," says University College London's Peter Rich, who worked at the Glynn Research Institute for 12 years and ended up running it. (Last year, because of money troubles, Rich moved the institute to University College London and sold Glynn House.)

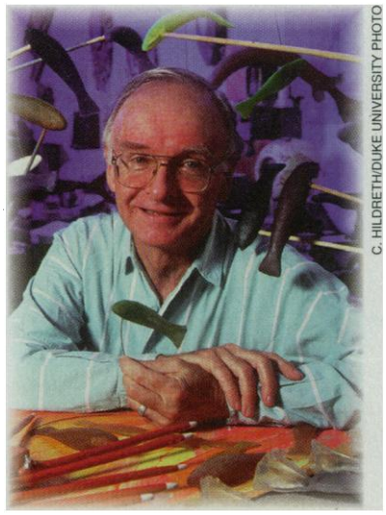
Chemist Luis Leloir, who won the Nobel Prize in 1970 for discovering sugar nucleotides and elucidating how they build carbohydrates, spent much of his own money supporting the research institute he headed, the Institute for Biochemical Research, in Buenos Aires, Argentina. Leloir, who died in 1987, "was a very rich man," explains Luis Quesada-Allue, a graduate student of Leloir's. "He was able to maintain for many years the library, mostly journals, of this institute. He was also able to fill any gap in the financing of lab requirements, using his own cash. I believe that probably many times, he silently covered many 'holes' in budgets of the institute as a whole and [those] of other researchers."

Invertebrate zoologist Stephen Wainwright of Duke used money he inherited from his family—which owned a prominent company that made bicycle and motorcycle chains—to start his own foundation to fund scientific work. Named after the first coral reef that Charles Darwin found on his H.M.S. *Beagle* voyage, the Cocos Foundation operated until Wainwright's money ran out a few years ago. Along the way, Wainwright funded his own lab, colleagues (who refused to take money from him directly), graduate students, and scientific meetings.

Asked how he began to fund his own work, Wainwright jokes, "By carefully selecting my parents." While still in graduate school, he told his father he had applied for an NSF fellowship. "He questioned me more closely than he ever had on anything," recalls Wainwright. "He said [to] leave the money for the people who need it. I've definitely been guided by that."

Other independently wealthy researchers

have been mainstream grant recipients, but have used their own money to supplement their work. The University of Pennsylvania's Britton Chance, for example, heir to the Chance Vought airplane company (which made a famous World War II plane), says staffers at the National Institutes of Health joke that they have a name for people who receive too many of their grants: BC, his initials. But Chance, a biophysicist, also has liberally tapped his own funds when he believed his work was promising but too innovative to make it through the conservative peer-review process. He gives the example of a cryogenic magnet, used for medical diagnosis, that he and George Radda of Oxford University developed. Chance says he "plunked down 80 kilobucks" of his own money to help build the machine. "If you really love research and have a societal impulse and realize this technology could help people, you go for it," he says



C. HILDRETH/DUKE UNIVERSITY PHOTO

Family foundation. Zoologist Stephen Wainwright of Duke University used money he inherited from his family to start a foundation to fund scientific work.

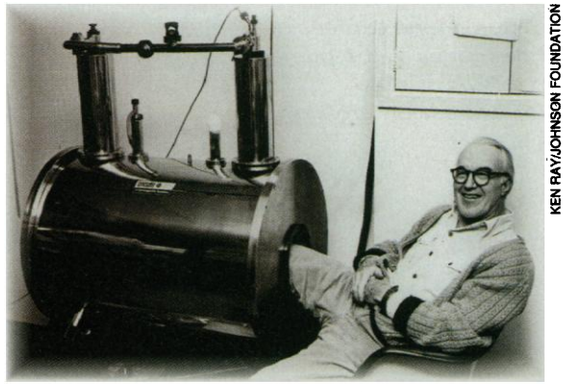
Although he's not wealthy, the University of South Florida's Morrill has donated a significant chunk of his income to fund his lab: For nearly 30 years, he has plowed $15,000 to $20,000 a year in earnings from consulting into his research. Morrill says he decided to spend his own money on the lab after he took his first environmental consulting job for a local developer in 1968. "I'd been on the sidelines watching people be environmental consultants, and they'd lost the respect of their scientific colleagues," says Morrill. "I vowed then and there to use this money for professional purposes." In addition to keeping his lab afloat, Morrill's generosity has sent many an undergraduate to a scientific conference or an exotic field site, or bought luxuries such as canoes (needed for gathering samples) and extra journals. "I've always figured my salary should be enough to take care of me," says Morrill.

Duke physicist John Madey has also invested substantial amounts of outside income into his research. He spent $100,000 he had made in royalties from the free electron laser—plus $40,000 or so from savings and stocks—on the development of a lower powered device that could be used for surgery and other applications. "There just wasn't the interest [from funding agencies]," says Madey. "It was viewed as blue sky. Maybe if I was willing to knock on those doors for 3 or 4 years they would have opened up, but it didn't make sense to wait. The opportunity was there."

"If you accumulate more money than you need, it's very reasonable to spend it on something useful for mankind," adds organic chemist Derek Barton of Texas A&M University in College Station. Barton, who won the Nobel Prize in 1969 and is now 79 years old, says he uses his own money primarily to hire more students to work in his lab, but he would not spend it on equipment. "If you support a student he'll be grateful," says Barton. "If you support a piece of equipment, it has no soul."

Pluses and minuses

Ask any self-funded scientist what is the chief benefit of bypassing the traditional granting process, and the most likely answer will be the freedom to pursue dogma-challenging, creative work that conservative peers reviewing a grant application would shun. Self-funded researchers can also roam over different scientific disciplines without having to prove their credentials first. Their students often have the luxury of working on a wide range of projects. And, glory of glories, for every grant application they don't write, they have more time to do their research.



KEN RAY/JOHNSON FOUNDATION

A leg up for science. The University of Pennsylvania's Britton Chance, whose family owned the Chance Vought airplane company, has tapped his own funds to support work—such as this cryogenic magnet—that he believes is too innovative to make it through the conservative peer-review process.

There are less obvious side benefits, too. "Anytime I don't apply for an NSF grant, it allows for a younger person to get one," offers Morrill. He notes that spending his own money, which universities typically view as a donation, also gives him more bang for his bucks than a grant would: "I get 100% return on money because they don't charge me overhead." Madey calculates that his $140,000 investment to develop his free electron laser had the effect of $250,000 in grants.

But this last point highlights one of the main limits to self-funding: Universities depend on overhead money from grants. "Eight or 10 years ago, I was told I'd have to bring in overhead money," says Berkeley's Greene. "I'm lucky to be at Berkeley because natural history is important here," he says, but he believes his self-funding has hampered his career advancement: "I've probably been promoted more slowly." Other self-funded researchers, who did not want to be named, say they have had their labs shut down because they didn't bring in overhead dollars.

Researchers who either choose or are forced to work without grants pay other costs, too. "One of the problems is you lose external validation," says Nobelist Joshua Lederberg of Rockefeller University in New York City. "That can be as important as the money." Another drawback, says Berkeley's Koehl, who regularly wins grants, is that the grant process can help shape a research project positively. "Working out the technical details for proposals and getting feedback are useful exercises," she says.

And self-funding is not always best for one's pride. One independently wealthy researcher who has occasionally used his own funds to support his lab asked not to be named because he said he wouldn't want any of his relatives to get the wrong impression. "I could have gone into my father's business," he explains. "I liked the idea that if I succeeded in science, it was my own doing." And Stanford University immunologist Irving Weissman doesn't brag about the fact that he has helped his lab survive while waiting for a new grant. "I do it when we go over budget," he says. "You do it so you don't lose people. You're kind of embarrassed that you don't have money from any other sources. I don't do it out of any great desire."

The California chemist who first saw the light 15 years ago has no such qualms. "The main thing I just find fascinating is I do know a fair number of scientists who have the means to at least partially support themselves who don't do it," he says. "That's the intriguing thing to me. Why don't they? What's the barrier to doing it? If you really love the science, why not put part of what you have into allowing it to be even more fun?"

–Jon Cohen