Billionaires With Big Ideas Are Privatizing American Science

Credit Schmidt Ocean Institute

Funding the Future

As government financing of basic science research has plunged, private donors have filled the void, raising questions about the future of research for the public good.

Last April, President Obama assembled some of the nation's most august scientific dignitaries in the East Room of the White House. Joking that his grades in physics made him a dubious candidate for "scientist in chief," he spoke of using technological innovation "to grow our economy" and unveiled "the next great American project": a $100 million initiative to probe the mysteries of the human brain.

Along the way, he invoked the government's leading role in a history of scientific glories, from putting a man on the moon to creating the Internet. The Brain initiative, as he described it, would be a continuation of that grand tradition, an ambitious rebuttal to deep cuts in federal financing for scientific research.

"We can't afford to miss these opportunities while the rest of the world races ahead," Mr. Obama said. "We have to seize them. I don't want the next job-creating discoveries to happen in China or India or Germany. I want them to happen right here."

Wendy Schmidt and her husband are advancing ocean studies. Credit Béatrice de Géa for The New York Times

Absent from his narrative, though, was the back story, one that underscores a profound change taking place in the way science is paid for and practiced in America. In fact, the government initiative grew out of richly financed private research: A decade before, Paul G. Allen, a co-founder of Microsoft, had set up a brain science institute in Seattle, to which he donated $500 million, and Fred Kavli, a technology and real estate billionaire, had then established brain institutes at Yale, Columbia and the University of California. Scientists from those philanthropies, in turn, had helped devise the Obama administration's plan.

American science, long a source of national power and pride, is increasingly becoming a private enterprise.

In Washington, budget cuts have left the nation's research complex reeling. Labs are closing. Scientists are being laid off. Projects are being put on the shelf, especially in the risky, freewheeling realm of basic research. Yet from Silicon Valley to Wall Street, science philanthropy is hot, as many of the richest Americans seek to reinvent themselves as patrons of social progress through science research.

The result is a new calculus of influence and priorities that the scientific community views with a mix of gratitude and trepidation.

"For better or worse," said Steven A. Edwards, a policy analyst at the American Association for the Advancement of Science, "the practice of science in the 21st century is becoming shaped less by national priorities or by peer-review groups and more by the particular preferences of individuals with huge amounts of money."

They have mounted a private war on disease, with new protocols that break down walls between academia and industry to turn basic discoveries into effective treatments. They have rekindled traditions of scientific exploration by financing hunts for dinosaur bones and giant sea creatures. They are even beginning to challenge Washington in the costly game of big science, with innovative ships, undersea craft and giant telescopes — as well as the first private mission to deep space.

The new philanthropists represent the breadth of American business, people like Michael R. Bloomberg, the former New York mayor (and founder of the media company that bears his name), James Simons (hedge funds) and David H. Koch (oil and chemicals), among hundreds of wealthy donors. Especially prominent, though, are some of the boldest-face names of the tech world, among them Bill Gates (Microsoft), Eric E. Schmidt (Google) and Lawrence J. Ellison (Oracle).

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This is philanthropy in the age of the new economy — financed with its outsize riches, practiced according to its individualistic, entrepreneurial creed. The donors are impatient with the deliberate, and often politicized, pace of public science, they say, and willing to take risks that government cannot or simply will not consider.

Yet that personal setting of priorities is precisely what troubles some in the science establishment. Many of the patrons, they say,

are ignoring basic research — the kind that investigates the riddles of nature and has produced centuries of breakthroughs, even whole industries — for a jumble of popular, feel-good fields like environmental studies and space exploration.

As the power of philanthropic science has grown, so has the pitch, and the edge, of the debate. Nature, a family of leading science journals, has published a number of wary editorials, one warning that while "we applaud and fully support the injection of more private money into science," the financing could also "skew research" toward fields more trendy than central.

"Physics isn't sexy," William H. Press, a White House science adviser, said in an interview. "But everybody looks at the sky."

Fundamentally at stake, the critics say, is the social contract that cultivates science for the common good. They worry that the philanthropic billions tend to enrich elite universities at the expense of poor ones, while undermining political support for federally sponsored research and its efforts to foster a greater diversity of opportunity — geographic, economic, racial — among the nation's scientific investigators.

Historically, disease research has been particularly prone to unequal attention along racial and economic lines. A look at major initiatives suggests that the philanthropists' war on disease risks widening that gap, as a number of the campaigns, driven by personal adversity, target illnesses that predominantly afflict white people — like cystic fibrosis, melanoma and ovarian cancer.

Public money still accounts for most of America's best research, as well as its remarkable depth and diversity. What is unclear is how far or fast that balance is shifting, since no one, either in or out of government, has been comprehensively tracking the magnitude and impact of private science. In recognition of its rising profile, though, the National Science Foundation recently announced plans to begin surveying the philanthropic landscape.

There are the skeptics. Then there are the former skeptics, people like Martin A. Apple, a biochemist and former head of the Council of Scientific Society Presidents.

Eric E. Schmidt

COMPANY: Google

FORTUNE: $9.3 billion

RESEARCH FOCUS:

Wendy & Eric Schmidt have given more than $100 million to the Schmidt Ocean Institute. At no cost, the institute lets scientists use its research vessel, Falkor, to explore deep mysteries around the globe, including undersea volcanoes and unfamiliar forms of life.

Initially, Dr. Apple said, he, too, saw the donors as superrich dabblers. Now he believes that they are helping accelerate the overall pace of science. What changed his mind, he said, was watching them persevere, year after year, in pursuit of highly ambitious goals.

"They target polio and go after it until it's done — no one else can do that," he said, referring to the global drive to eradicate the disease. "In effect, they have the power to lead where the market and the political will are insufficient."

And their impact seems likely to grow, given continuing federal budget wars and their enormous wealth. Indeed, a New York Times analysis shows that the 40 or so richest science donors who have signed a pledge to give most of their fortunes to charity have assets surpassing a quarter-trillion dollars.

There are also signs of a growing awareness, among some philanthropists, that this influence brings a responsibility to address some of the criticisms leveled at them. Last year, a coalition of leading science foundations announced a campaign to double private spending on basic research over a decade — to $5 billion a year — as a counterweight to money rushing into health and other popular fields.

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“Today, federal funding of basic research is on the decline,” the group said. “The best hope for near-term change lies with American philanthropy.”

A New Template

When Mr. Ellison, chief executive of the Oracle Corporation, heard a Nobel laureate biologist give a talk at Stanford about artificial intelligence, he was mesmerized. It was the early 1990s, and the idea of applying fast computers to genetic riddles was new. “I had never experienced anything like it,” Mr. Ellison recalled.

He invited the scientist, Joshua Lederberg of Rockefeller University, to visit him at his California estate. The visit went so well that Mr. Ellison handed the scientist a key to the house and asked him to think of it as his second home. Dr. Lederberg took him up on the offer, and over many dinners in what he would call “the most gorgeous setting in the world” — complete with Japanese teahouse, strolling gardens and ponds of ornamental fish — the men discussed many things, from Mr. Ellison’s early interest in molecular biology to the idea that great wealth can do great good.

In 1997, the friendship gave birth to the Ellison Medical Foundation. Hundreds of biologists have benefited from its patronage, and three have won Nobel Prizes. So far, Mr. Ellison, listed by Forbes magazine as the world’s fifth-richest man, has donated about half a billion dollars to science.

It’s not that Mr. Ellison is the biggest or most visible of the philanthropists. (That distinction probably belongs to Bill Gates, who has donated roughly $10 billion for global public health.) But his work is very much a template for the new private science.

In the traditional world of government-sponsored research, at agencies like the National Science Foundation and the National Institutes of Health, panels of experts pore over grant applications to decide which ones get financed, weighing such factors as intellectual merit and social value. At times, groups of distinguished experts weigh in on how to advance whole fields, recommending, for instance, the construction of large instruments and laboratories costing billions of dollars.

By contrast, the new science philanthropy is personal, antibureaucratic, inspirational.

For Wendy Schmidt, the inspiration came in 2009, from a coral reef in the Grenadine islands of the Caribbean. It was her first scuba dive, and it opened her eyes to the riot of nature.

She talked it over with her husband, Eric, the executive chairman of Google, and the two decided that marine science needed more resources. (The government’s research fleet, 28 ships strong in 2000, has shrunk by about a third and faces further cuts.) So they set up the Schmidt Ocean Institute in Palo Alto, Calif., and poured in more than $100 million. The centerpiece is a ship nearly the length of a football field that, unlike most research vessels, has a sauna and a helicopter pad.

“We want to rapidly advance scientific research, to speed it up,” Mrs. Schmidt said in an interview.

Gordon Moore

COMPANY: Intel

FORTUNE: $5 billion

RESEARCH FOCUS:

Has focused his giving on physics, biology, botany, geology, ocean science, environment, forestry and conservation. Donated $200 million for the Thirty Meter Telescope, right, to be built on a mountaintop in Hawaii.

The philanthropists’ projects are as diverse as the careers that built their fortunes. George P. Mitchell, considered the father of the drilling process for oil and gas known as fracking, has given about $360 million to fields like particle physics, sustainable

development and astronomy — including $35 million for the Giant Magellan Telescope, now being built by a private consortium for installation atop a mountain in Chile.

The cosmos, Mr. Mitchell said in an interview before his death last year, "is too big not to have a good map."

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Eli Broad, who earned his money in housing and insurance, donated $700 million for a venture between Harvard and the Massachusetts Institute of Technology to explore the genetic basis of disease. Gordon Moore of Intel has spent $850 million on research in physics, biology, the environment and astronomy. The investor Ronald O. Perelman, among other donations, gave more than $30 million to study women's cancers — money that led to Herceptin, a breakthrough drug for certain kinds of breast cancer. Nathan P. Myhrvold, a former chief technology officer at Microsoft, has spent heavily on uncovering fossil remains of Tyrannosaurus rex, and Ray Dalio, founder of Bridgewater Associates, a hedge fund, has lent his mega-yacht to hunts for the elusive giant squid.

The availability of so much well-financed ambition has created a new kind of dating game. In what is becoming a common narrative, researchers like to describe how they begged the federal science establishment for funds, were brushed aside and turned instead to the welcoming arms of philanthropists. To help scientists bond quickly with potential benefactors, a cottage industry has emerged, offering workshops, personal coaching, role-playing exercises and the production of video appeals.

Advancement Resources of Cedar Rapids, Iowa, did its first workshop in 2002 and has now conducted hundreds across the country, mostly to coach scientists and medical institutions in what it calls the art of donor development. "We help make their work accessible to people who do not have scientific backgrounds but do understand money," said its founder, Joe K. Golding.

Medical institutions are even training their own scientists and doctors in the art of soliciting money from grateful — and wealthy — patients. And Nature ran a lengthy article giving tips on how to "sell science" and "woo philanthropists." They included practicing an "elevator pitch" — a digest of research so compelling that it would seize a potential donor's attention in the time between floors.

Practice in front of the mirror and "with anyone who will listen," it advised. When the pitch is smooth enough, "aim high."

Government Gloom

In November 2012, the White House issued a thick and portentous update on the health of the nation's research complex. Produced by Mr. Obama's Council of Advisors on Science and Technology, it warned of American declines, emphasized the rise of scientific rivals abroad and called for bold policy interventions.

"Without adequate support for such research," the experts wrote in their cover letter, "the United States risks losing its leadership in invention and discovery."

The financial outlook had fallen far and fast. Congress had long reached across party lines to support government research, for its economic and military rewards and because the distribution of billions of dollars plays well come election time. After rising steadily for decades, federal science financing hit a high point in 2009, in the early days of the Obama administration, as Congress, to stimulate the economy amid the global financial crisis, allocated about $40 billion for basic science.

That bipartisan consensus eroded with the Republican takeover of the House of Representatives in the 2010 midterm elections and the budget battles that followed. Spending on basic research has fallen by roughly a quarter, to $30 billion last year, one of the sharpest declines ever.

The cutbacks translate into layoffs: A group of scientific societies recently surveyed 3,700 scientists and technical managers and reported that 55 percent knew of colleagues who had lost jobs or expected to lose them soon.

In an interview, the director of the National Institutes of Health, Dr. Francis S. Collins, called 2013 one of his agency's darkest years ever, with fewer grants awarded and with jobs and programs cut. In decades past, research financed by the institutes won

more than 100 Nobel Prizes. The cutbacks, Dr. Collins said, were “profoundly discouraging.”

Largely unmentioned in the gloom is the rise of private science. The White House report mentioned philanthropy only in passing. “We didn’t do it justice,” said one of the authors, speaking on condition of anonymity because he was not authorized to discuss the report’s preparation.

James Simons

FIELD: Hedge funds

FORTUNE: $12.5 billion

RESEARCH FOCUS:

Has given $1.1 billion for math and science, including $375 million for autism research. Also raised $13 million to save the Relativistic Heavy Ion Collider, left. It is on Long Island and is 2.4 miles around.

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Science policy has always been shot through with politics. Little surprise, then, that political sensitivities have been stoked by the injection of philanthropic money into this traditionally public sphere.

The official reticence about private science may reflect, in part, a fear that conservatives will try to use it to further a small-government agenda. Indeed, some of the donors themselves worry that too much focus on private giving could diminish public support for federal science.

“It’s always been a major worry,” said Robert W. Conn, president of the Kavli Foundation, which has committed nearly a quarter of a billion dollars to science and is part of the private effort to increase financing for basic research. “Philanthropy is no substitute for government funding. You can’t say that loud enough.”

Representative Lamar Smith would beg to disagree. Mr. Smith, a 14-term Republican from Texas, helped found the House Tea Party Caucus and, after the Tea Party ferment swept the Republicans to power in the House, became chairman of the Committee on Science, Space and Technology.

Last year, after a meteor exploded over Russia and injured more than 1,200 people, Mr. Smith declared that new sensors in space were “critical to our future.” Then he held a hearing to showcase a satellite-borne telescope meant to scan the solar system for speeding rocks that could endanger the planet. Money for the venture comes from leaders of eBay, Google and Facebook, as well as anonymous private donors.

“We must better recognize what the private sector can do to aid our efforts to protect the world,” Mr. Smith said.

In decades past, that job would have belonged to NASA. But at the hearing, the project’s head, Edward T. Lu, a former astronaut and Google executive, testified that the spacecraft’s cost — $450 million — was about half what the government would have spent.

Committee members enthusiastically suggested that the private endeavor pointed the way toward a new era of lower federal spending.

“Congratulations!” said Representative Dana Rohrabacher, a California Republican. “I’m totally supportive.”

In the recent interview, Dr. Collins of the N.I.H. acknowledged that the philanthropists were “terrifically important” for filling gaps and taking advantage of new opportunities. The science, he emphasized, “has never been at a more exciting moment.”

Still, he and other experts are quick to add that the private surge is far too small to replace public financing.

The N.I.H. budget alone runs to about $30 billion — half for basic research. At least for now, said Dr. Press, the board chairman of the American Association for the Advancement of Science, private giving is "still a drop in the bucket."

Uncharted Billions

For all that, the government knows very little about how much philanthropic money is flowing into science, or how it is being spent.

Science analysts say that knowledge is vitally important: Without it, the government cannot get a comprehensive picture and strive for a smart balance in the nation's overall science plans.

Anousheh Ansari

FIELD: Telecommunications

RESEARCH FOCUS:

Set off a boom in scientific prize competitions with a $10 million award for the first private craft that could send three people into space. In 2006, she trained for, right, and completed a trip to the International Space Station.

The issues are considered social as well as intellectual, and so, in their own grant-making decisions, federal agencies strive to ensure that their money does not flow just to established stars at elite institutions. They consider gender and race, income and geography.

Yet even as the federal government finely monitors its own investments in science research, philanthropy remains largely uncharted territory. (The government does carefully track science financed by private industry, but that research tends to produce such practical things as drugs, jets and gadgets, rather than fundamental insights into the mysteries of nature.)

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"People assume we do it," said John E. Jankowski, a senior analyst at the National Science Foundation, which not only finances research but also tracks science budgets. "But we don't, because of resource constraints."

The task is daunting. If government science is centralized, science philanthropy is determinedly not: It is an agglomeration of donors, from the wealthiest patrons to people who write modest checks to their favorite charities.

The National Academy of Sciences has repeatedly urged the government to step up its monitoring of the uncharted billions. And recently, Dr. Jankowski said, the National Science Foundation began developing a pilot survey, to be completed in about a year.

If budgets allow, he added, the agency plans to "ultimately fund" a comprehensive survey.

In the meantime, Fiona E. Murray, a professor of entrepreneurship at M.I.T., has taken a different tack, studying not the donors but the recipients — particularly the nation's research universities.

To simplify the task, she looked at the 50 leading universities in science-research spending, places like Columbia and Stanford, Duke and Harvard, Michigan and Johns Hopkins.

What Dr. Murray found sheds light on the scope of the phenomenon, as well as questions about who benefits. Private donors now account for roughly 30 percent of the schools' research money, she reported, adding that the rise of science philanthropy may simply help "rich fields, universities and individuals to get richer."

The new patrons are responsible for one of the most striking trends on these campuses: the rise of privately financed institutes, the new temples of science philanthropy.

In Cambridge, Mass. — home to M.I.T. and Harvard — they include the $100 million Ragon Institute for immunology research, the $150 million Koch Institute for cancer studies, the $165 million Stanley Center for Psychiatric Research, the $250 million Wyss Institute for Biologically Inspired Engineering, the $350 million McGovern Institute for brain research, the $450 million Whitehead Institute for Biomedical Research and the $700 million Broad Institute for genome research.

“If I’m a rich person, I’m going to give to a leading institution — to Harvard or Princeton,” Dr. Murray said in an interview. That pattern, she added, “poses big issues” for the nation.

A Focus on Disease

If the map of the world of private science has yet to be drawn, one thing is clear: Much of the money is going into campaigns for a cure.

This private war on disease has resulted not only in significant advances in treatment, but also in what experts describe as a major breakthrough in how biomedical research is done. The method opens up blockages that have traditionally kept basic discoveries from being turned into effective treatments — especially for rare diseases that drug companies avoid for lack of potential profit.

Bill Gates

COMPANY: Microsoft

FORTUNE: $76 billion

RESEARCH FOCUS:

The Bill & Melinda Gates Foundation has spent $10 billion on global health, including tuberculosis, vaccines and the push to eradicate polio and malaria, which is transmitted by some mosquitoes, left.

“We think it’s potentially transformative,” said Maryann P. Feldman, a professor of public policy at the University of North Carolina at Chapel Hill who studies the approach.

The first success came with cystic fibrosis, which arises when a faulty gene clogs the lungs and pancreas with a sticky mucus. People with cystic fibrosis suffer from coughing, fatigue, poor digestion and slow growth, and die relatively young.

Around 2000, a surge of wealthy donors began making large contributions to the Cystic Fibrosis Foundation. Tom and Ginny Hughes of Greenwich, Conn., had two daughters with the disease, and gave millions of dollars. The family also posed in snapshots for the foundation’s “Milestones to a Cure” updates, and Mr. Hughes, a banker, helped the charity develop strategies to expand its fund-raising.

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Year after year, the foundation held galas, hikes, runs and golf tournaments, eventually raising more than a quarter-billion dollars. With great skill, it used the money to establish partnerships across industry and academia, smashing through the walls that typically form around research teams.

By early 2012, the financial surge produced the first treatment for an underlying cause of cystic fibrosis. The drug counters a gene mutation that accounts for 4 percent of the cases in the United States — about 1,200 people. The medication thinned the deadly mucus, lessening symptoms and drastically improving quality of life.

The success begot a global rush to turn basic discoveries into treatments, a field now known as translational science. It also inspired rich donors to shower new money on disease research.

Many of their efforts are rooted deep in personal or family trauma. Sometimes, by sheer force of genetics and demographics, that

impulse may risk widening historical racial inequalities in health care and disease research, disparities that decades of studies have shown to contribute to higher rates of disease and death among blacks, Hispanics and other minority groups.

A review of these campaigns finds that, as with cystic fibrosis — which mainly strikes people of Northern European descent — a significant number are devoted to diseases that disproportionately affect white people.

Ovarian cancer strikes and kills white women more often than minority women. In 2012, after his sister-in-law died of the disease at age 44, Jonathan D. Gray, the head of global real estate at the Blackstone Group, the private equity firm, gave the University of Pennsylvania $25 million to set up a center to study female cancers.

Melanoma, the deadliest of skin cancers, also strikes and kills whites preferentially. Debra Black, wife of the financier Leon Black, survived a bad scare. Soon after, the couple teamed up with Michael R. Milken, the former junk-bond financier, whose charity FasterCures gives advice on how to accelerate research, to found the Melanoma Research Alliance. It quickly became the world's largest private sponsor of melanoma research, awarding more than $50 million for work at Yale, Columbia and other universities.

Of course, the pervasiveness of most diseases means most philanthropists give comfort and medical relief across the lines of race and ethnicity. When Mr. Milken, for example, learned that he had prostate cancer, he set up a foundation to fight it. The charity has raised more than half a billion dollars, helping save not only him but also many black men, since they develop the disease more frequently than white men do.

So, too, the techniques of translational science, inspired by philanthropy, are now being applied in a federal effort against sickle cell anemia, a blood disorder that mainly strikes black people and has long been something of a research orphan.

Scientists first described sickle cell anemia in 1910 and uncovered its genetic basis in 1949. The discovery, by a team that included Linus Pauling, a Nobel laureate twice over, was central to the creation of the field of molecular medicine. Yet with little financing for sickle cell research, either public or private, no drug has been developed that targets the disease's underlying cause, even though it has crippled and killed millions of people.

The government effort began with Dr. Collins, the N.I.H. director, who as a biologist had helped uncover the cystic fibrosis gene. As the new cystic fibrosis treatment emerged, he pressed the government to adopt the breakthrough translational method, federal budget cuts notwithstanding. Today, the N.I.H. translational science center has an annual budget of more than $600 million and seeks new drugs for rare diseases, which number in the thousands.

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Dr. Collins, who works with many wealthy donors, said the government was trying to level the playing field rather than rush off to where "everybody's already piled up effort." An effective treatment for sickle cell disease, he said, has "been a long time coming."

Billionaires for Science

Some other noteworthy philanthropists who have shown a deep interest in science.

Lawrence J. Ellison

Oracle

$48 billion

Aging, brain, stem cells.

David H. Koch

Koch Industries

$40 billion

Food allergies, medical research and prostate cancer, which struck him.

Michael R. Bloomberg

Bloomberg News

$33 billion

Environment, public health, obesity, tobacco, road safety.

Jeff Bezos

Amazon

$32 billion

Brain and child development, ocean exploration.

COMPANY OR FIELD:

FORTUNE:

RESEARCH FOCUS:

Sergey Brin

Google

$31.8 billion

Parkinson's disease, which his mother has and for which he bears a risky gene.

Mark Zuckerberg

Facebook

$28.5 billion

Health, physics, life sciences, mathematics.

Paul G. Allen

Microsoft

$15.9 billion

Brain, health, ocean science, conservation and the hunt for signs of extraterrestrial life.

Harold Hamm

Oil, gas

$14.6 billion

Endocrinology and diabetes, which he has.

Ronald O. Perelman

Revlon, investments

$14 billion

Female cancers, infertility, Parkinson's disease, medicine.

Patrick Soon-Shiong

Pharmaceuticals

$10 billion

Health care and medical technology.

Eli Broad

Housing, insurance

$6.9 billion

Genetic medicine, stem cells and Crohn's disease, which struck a son.

Leon Black

Private equity

$5.8 billion

Melanoma, which his wife survived.

Michael R. Milken

Investments

$2.5 billion

Epilepsy, melanoma, public health and prostate cancer, which struck him.

Thomas F. Steyer

Hedge funds

$1.6 billion

Environment and sustainable energy.

A candidate drug is undergoing clinical trials and looks promising. In December, the company working with N.I.H. on the research effort announced that a single dose produced a “significant reduction” of pain for up to 24 hours.

Setting the Agenda

In the early 1980s, Leroy Hood, a biologist at the California Institute of Technology, proposed to make the first automated DNA sequencer, which he pitched to the National Institutes of Health as a way to rapidly identify the billions of hereditary units in every human cell. His grant proposals were rejected, so he turned to Sol Price, a warehouse-store magnate whose companies ultimately merged with Costco.

The breakthrough of the DNA sequencer led to the Human Genome Project — the federal effort that, at a cost of $3.8 billion,

mapped all the heritable units — and, more recently, to the burgeoning field of personal genomics.

Science philanthropy, Dr. Hood said, "lets you push the frontiers."

Over the years, the flood of private money has also inspired something of a reversal. In gene sequencing, in translational medicine, in the Obama administration's Brain initiative and in other areas, the federal government, instead of setting the agenda, increasingly follows the private lead.

A decade ago, Anousheh Ansari, a Texas engineer who made a fortune in telecommunications, financed a $10 million prize competition for the first private craft that could send three people into space. Her success spawned a boom. Private donors now back dozens of science awards, and the government offers hundreds of its own, motivated, according to a White House study, "by the success of philanthropic and private sector prizes."

Sometimes, private donors go to the government's aid. When budget cuts threatened to shut down a giant particle accelerator on Long Island in 2006, Dr. Simons, the hedge-fund investor, who lives nearby, raised $13 million to bail it out. As a result, research teams were able to keep exploring subatomic aspects of the blast that brought the universe into existence.

If the rich donors are to be believed, their financing of scientific research in the years ahead will expand greatly in size and scope. A main reason is the Giving Pledge.

In 2010, Mr. Gates, along with his wife, Melinda, and the investor Warren E. Buffett, announced the campaign. So far, roughly a fifth of America's nearly 500 billionaires have signed up, pledging to donate the majority of their fortunes to charity.

A Times analysis of the pledge letters made public shows that more than 40 percent of the signers plan to finance studies in science, health and the environment. With personal fortunes in excess of $250 billion, they are promising, at a minimum, to donate more than $125 billion. How much is destined for science is unclear, but several laid out objectives that are fairly extraordinary.

"We want to eradicate diabetes in our lifetime," wrote Harold Hamm, a leading figure in the North Dakota oil rush, and his wife, Sue Ann.

Jon M. Huntsman, a Utah billionaire whose son Jon Jr. unsuccessfully sought the 2012 Republican presidential nomination, said his philanthropy would "make sure cancer is vanquished."

Admirers of the new patrons — and the patrons themselves — say that, over the decades, the surge in donations will probably result in economic growth that helps the United States fend off global challengers. The private gifts, they emphasize, will become especially important if Washington funding continues its downward spiral.

Shortly before he died, Mr. Mitchell, the telescope man, spoke of his concern that American science was already losing its competitive edge. He cited the discovery of the Higgs boson, a subatomic particle seen as imparting mass to the universe. The finding was made at a particle accelerator in Europe after tight budgets shut down a rival machine near Chicago.

"We have no excuse" for losing the lead, Mr. Mitchell said. "We need to fix it."