a summary of the progress made in implementing the recommendations of the 2013 assessment. He told lawmakers that he needed some time but that he was "absolutely committed" to making the project run within a new baseline cost and on schedule.

Last summer in its version of the bill funding DOE, a Senate appropriations subcommittee ordered US withdrawal from ITER (see the 25 June 2014 piece in the Politics and Policy department on PHYSICS TODAY's website). Backers of the provision included Dianne Feinstein (D-CA) and Lamar Alexander (R-TN), the chair and the ranking minority member, respectively, of the subcommittee. But the measure was deleted from the Omnibus Appropriations Act. With their roles now reversed, Alexander and Feinstein will be the principal authors of the FY 2016 funding bill.

At a 25 March subcommittee hearing, Feinstein indicated that she hadn't backed off. She told DOE undersecretary Franklin Orr that she and Alexander are "seeing little benefit from our participation in ITER." Fusion energy is unlikely to become a reality within lawmakers' lifetimes, Feinstein said, and she lamented the $1.2 billion the US has already spent for a project "in another country that we may never see benefits from." She pointed to more recent cost estimates that put the US contribution for its 9% share of ITER anywhere from $4.1 billion to $6.5 billion (see PHYSICS TODAY, February 2014, page 20). That compares to the $2.4 billion DOE estimated in 2013.

Orr did not dispute Feinstein's numbers. "It's fair to say that the design at the early stages was not as far along as it needed to be for realistic cost estimates," he said. The changes made by the council to increase the director general's authority, "if accepted fully by all the members, would correct the management issues."

Departure from the project by the US, says Bigot, would be "a dramatic event" and "a pity."

David Kramer

Foundations join forces to raise funds for basic research

With federal funding in decline, philanthropists are stepping up to back risky projects, early-career researchers, and expensive scientific equipment.

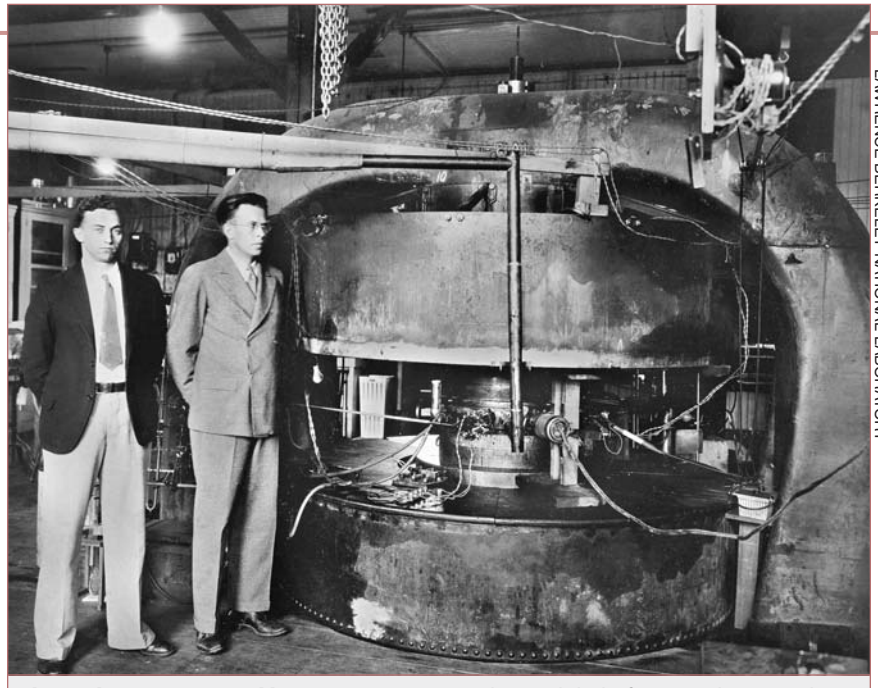
"We're living in an age where extraordinary fortunes are being made," says Robert Conn, president and CEO of the Kavli Foundation. Conn is board chairman of the Science Philanthropy Alliance (SPA), a consortium of Kavli and five other foundations formed in 2013; its mission is to attract new donors and larger donations in support of basic research in the US.

Rather than acting as a source of new funding, SPA (http://www.sciencephilanthropyalliance.org) intends to be a resource for other philanthropic organizations and individuals, helping them "identify areas of fundamental research that need funding," says condensed-matter physicist Marc Kastner, SPA's inaugural president. Hired in March, the former MIT dean of science has set up temporary offices in Palo Alto, California, at the headquarters of the Gordon and Betty Moore Foundation, another of SPA's founding members. The other four member organizations are the Alfred P. Sloan Foundation, Howard Hughes Medical Institute (HHMI), Research Corporation for Science Advancement (RCSA), and the Simons Foundation. In 2013 those foundations boasted $28 billion in combined net assets and donated more than $1 billion to science research.

SPA's primary goal is to increase the total philanthropic contribution to US-based basic research by an additional $1 billion a year by 2018. Conn estimates that the annual contribution in recent years has ranged from $2 billion to $4 billion; SPA will work to get a more accurate figure, he says. The alliance has already recruited 16 leading US universities to set up dedicated funds that receive and disburse charitable donations for discovery-driven research. "Establishing these funds sends a signal to the university's donor base that basic research matters," says Conn.

Fail and try again

A total of $5 billion per year from private donations is still only about 15% of the $32 billion that the federal government allocated for basic research in fiscal year 2015—or of the $33 billion President Obama has requested for FY 2016



LAWRENCE BERKELEY NATIONAL LABORATORY

The cyclotron, invented by E. O. Lawrence (right), with help from graduate student Milton Stanley Livingston (left), owes much to the generosity of philanthropic organizations, including the Research Corporation for Science Advancement, to which Lawrence assigned the patent.

(see PHYSICS TODAY, April 2015, page 25). In recent years, however, federal funding for basic research as a percentage of GDP has been declining—a trend Conn says "will leave science, and the nation, in bad straits."

Because of constraints on the federal discretionary budget, within which R&D spending falls, the tendency in government "is to fund things that are more applied and less basic," says Kastner. Foundations, by contrast, "can fund riskier projects." Some scientists in Europe, where foundations contribute much less to research, "really wish there were more philanthropy there, because they want to do things their governments are not funding," Kastner adds.

Taking a $90 million risk, for example, is the Moore Foundation's Emergent Phenomena in Quantum Systems (EPiQS) program, which looks to fund researchers and projects that have the potential to make fundamental breakthroughs in quantum materials research. Last fall, the program awarded five-year, $1.8 million grants to 19 experimentalists; it is also funding researchers focused on theory and materials synthesis. "What we hope to see is the majority of grantees unleashing their potential and taking more risks," says program officer Dusan Pejakovic. "I expect many of them to fail many times."

"If you get into a frontier area of science, nobody knows where it's going to go," says Dudley Herschbach, who won the 1986 Nobel Prize in Chemistry. "And yet [for federal grants] you have to predict several years ahead, instead of letting the work lead you by the hand." Moreover, he adds, "it's astounding how hard it is to get a grant from NSF. It takes a year to get the verdict and another long period before you even receive the funding."

Up-and-comers

Early-career researchers, who may not have built up a track record, also stand to gain from private donations. Herschbach is one of 40 Nobelists to have received early-career grants from RCSA. "I remember that all you had to do was tell them your idea and you got the money within a month or two," he says. In March, SPA members HHMI and the Simons Foundation, along with the Bill and Melinda Gates Foundation, announced early-career grants worth up to $400 000 per year for five years for biological or biophysical research.

Several of the 16 universities that have set up SPA-inspired basic-research funds intend to use them for early-career scientists. Stony Brook University is using donations to its Discovery Fund as cash awards for assistant and associate professors who present winning proposals and public TED-style talks. The university's goal is to raise $25 million for the fund within five years, says Dexter Bailey, Stony Brook's senior vice president for university advancement.

"[This fund] is a really important development in the history of our institution," says Bailey. "We're in the process of hiring 250 faculty over the next five years—probably north of 60% will be in STEM and medicine—and there's increased pressure to find ways to provide them with the resources they need."

Funding expensive scientific equipment is a "sweet spot for philanthropy," says Vicki Chandler, the Moore Foundation's chief program officer for science. "There's a real need for instruments in the $1- to $2-million range,"

STONY BROOK UNIVERSITY

Stony Brook University's $200 000 Discovery Prize was awarded in December 2014 to biology professor Laurie Krug, who is working to use nanoparticles as molecular scissors to snip virus DNA. The school's new Discovery Fund accepts charitable donations to be allocated solely for basic research projects.

which are not usually covered by federal grants, she says. Some SPA members have also supported the construction and operation of even larger projects involving science instruments. For example, the Sloan Digital Sky Survey, which includes a telescope and several spectrographs that have produced a detailed map of the universe to date, was launched with significant backing from the Sloan Foundation.

Wealth attracts wealth

Relying on charity for research funding comes with its own risks. A large portion of a foundation's income is based on how its endowment performs in the stock market. Also, who and what philanthropists choose to fund is often based on their personal associations and passions. For example, Stony Brook's Discovery Fund received a $500 000 seed donation from the Stony Brook Foundation, whose chairman emeritus is hedge-fund billionaire James Simons, former chair of the university's mathematics department and cofounder of the Simons Foundation.

In an opinion article for the July 2014 issue of *Chronicle of Philanthropy*, Pablo Einsenberg, a senior fellow at the Georgetown University Center for Public and Nonprofit Leadership, argues that foundations and philanthropists exacerbate wealth inequality in the US. "Just look at the giving patterns of most of the people who have signed the Giving Pledge, the effort by Bill and Melinda Gates and Warren Buffett to encourage their fellow billionaires to give at least half their fortunes away," he writes. "It's the same causes—colleges, hospitals, and other elite institutions—that keep getting money from the richest Americans."

Wealthy philanthropists also tend to favor biomedical research. SPA's members are among the few foundations that target physical sciences research; the exception is HHMI, which last year doled out more than $700 million to biomedical projects. For example, of the Kavli Foundation's 17 endowed institutes, 13 conduct research in cosmology, astrophysics, theoretical physics, and nanoscience. Particularly in those areas of physical sciences research, SPA can be "a resource and a voice to new philanthropy," says Conn.

"People get excited about cosmology and astronomy," says Kastner. But researchers pursuing some other fundamental physics topics "will have to make their case," he adds. "You can't just tell philanthropists how to spend their money."

Jermey N. A. Matthews

Momentum grows for new climate agreement

Pledged US greenhouse gas cuts should need no new authorizations from Congress, officials say.

Now that the US and Russia have pledged sizable reductions in their greenhouse gas emissions over the next 10–15 years, industrialized countries that spew 80% of the world's pollutants have announced their commitments in advance of a new global agreement to slow climate change.

In its submission to the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) on 31 March, the Obama administration pledged to reduce US emissions of carbon dioxide and other greenhouse gases by 26–28% from 2005 levels by 2025. The next day, Russia promised to lower its emissions by 25–30% from 1990 levels by 2030. The UNFCCC is the parent treaty to the 1997 Kyoto Protocol and has 196 member states.

Neither China, the world's largest greenhouse gas emitter, nor India, the third largest after the US, had submitted their pledges—so-called intended nationally determined contributions (INDCs)—by press time. But during President Obama's November 2014 visit to Beijing, Chinese president Xi Jinping committed to begin curtailing that nation's steadily increasing emissions in 2030.

The European Union's 28 member nations have agreed to a binding reduction of 40% from 1990 levels by 2030. Mexico, Norway, Switzerland, and Gabon have also submitted INDCs. Industrialized countries that have yet to submit INDCs as of mid-April include Japan, Canada, Australia, and New Zealand.

The INDCs are a prelude to new climate change negotiations that are expected to wrap up in Paris in December. The goal of the Paris talks is to reduce the buildup of greenhouse gases sufficiently to prevent world temperatures from rising more than 2 °C from their pre-industrial levels. The initial INDCs

J. A. DONNAN, GLACIER NATIONAL PARK ARCHIVES

KEVIN JACKS, US GEOLOGICAL SURVEY

The retreat of the Grinnell glacier in Montana's Glacier National Park is captured in these photographs taken in 1941 and 2013. According to some models, all of the park's glaciers may disappear by 2030.