program with ESA around the Vega rocket. There is a big Earth observation program. Then, of course, there is the effort in the space station. In a few months, another Italian astronaut will go to the station.

PT: What do you see as the greatest challenges facing you?

Bignami: Flying missions. We need a vision at ASI, immediately, and we need to start implementing it. We need to redefine Italy's role in ESA. And, thinking ahead to the next meeting of ESA at the ministerial level, which will be in 2008—coinciding with the 20th anniversary of ASI—I will lobby for Russia to join ESA.

Toni Feder

NASA cancels science flight, ditches international partners

A 12-year project to build a billion-dollar particle-physics lab in space is grounded unless someone comes up with at least $380 million.

Sam Ting walked into a meeting with PHYSICS TODAY last month with an entourage of high-powered scientists from nuclear physics labs across Europe and Asia. They were there to go to bat for the Alpha Magnetic Spectrometer (AMS), the experiment spearheaded by Ting, an MIT particle physicist. Despite the AMS being NASA's main science justification for completing the International Space Station (ISS), the agency announced in February that it has put the experiment's flight on the chopping block.

By detecting high-energy charged cosmic rays in space, the AMS might discover unknown pulsars and x-ray sources and observe dark matter (see PHYSICS TODAY, February 2003, page 30). Above all, it might solve the *CP* violation problem: Where is the universe's antimatter? "No one has ever measured primordial antimatter. . . . It would be another Nobel Prize for Sam Ting," says Giovanni Bignami, the newly nominated president of the Italian Space Agency (see the story on page 28). "No matter how large an accelerator you make, you are never going to reach the same high energies as you get with cosmic rays," says Ting, adding that it's impossible to know what the AMS might discover. "Nearly every major science experiment, such as the *Hubble Space Telescope* [*HST*] or the Tevatron at Fermilab, found major unexpected discoveries that the machines were not originally designed to study."

A long campaign

Ting first proposed the AMS in the early 1990s, when the US physics community was still reeling from the cancellation of the Superconducting Super Collider. He persuaded the Department of Energy's Office of Science to support the experiment, and NASA to ferry the AMS to the ISS and to provide power and communications. CERN agreed to provide free assembly space and logistics support. Some 16 countries—including both China and Taiwan—signed on, and 95% of the experiment's $1.5 billion construction costs were paid by space agencies, national funding agencies, and universities from across Europe and Asia. The DOE provided $30 million. So far NASA has invested $55 million, mainly toward building a transport cradle for the space shuttle.

In 1998 a 10-day flight of a prototype proved that one could isolate the powerful magnets in the detector from interference of Earth's magnetic field, which is vital for detecting charged cosmic rays. The test flight also discovered helium fluxes in the magnetosphere that behave in ways not predicted by cosmic-ray models, says Ting. The prototype used permanent ferromagnets; the final version has liquid-helium-cooled superconducting magnets. Once assembled, the AMS will also have four times as many detectors as the prototype and incorporate recent advances to shrink the detector—with its more than 300 000 detection channels—to only a 3-meter cube. "The detector is complex even by terrestrial standards," says Switzerland's AMS team leader, Maurice Bourquin, former rector of the University of Geneva.

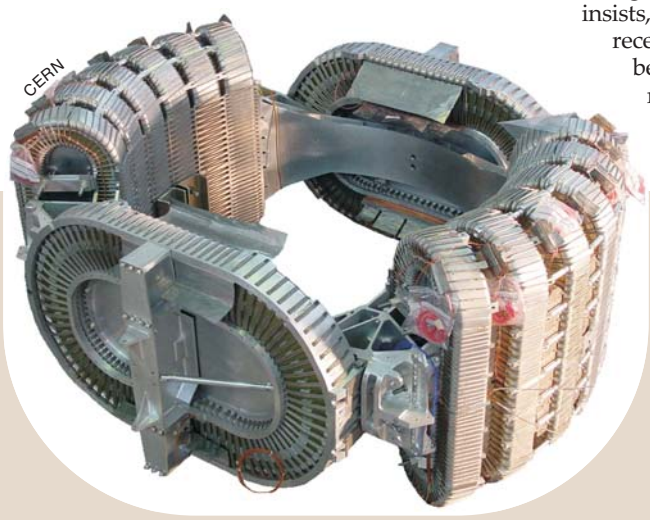
A DOE review last year concluded that the justification for continuing with the project was undeniable. "Plans should be made to place [the AMS] onto the space station, in order for it to carry out its promising science," the review says. "I recognize that NASA has shifted priority to Moon–Mars, but that doesn't justify walking away from flying this already built, expensive, and beautiful device," says Caltech's Barry Barish, who chaired the review. "I know of no other missions that are proposed to do this science."

Not giving up

NASA first warned in September 2005 that it might not fly the AMS. Following the *Columbia* accident in January 2003, the number of shuttle flights was curtailed. The shuttle is scheduled for retirement in 2010, and NASA has tagged the remaining flights for completing the ISS and sending a service mission to the *HST* (see PHYSICS TODAY, December 2006, page 33).

Late in 2005, NASA started feasibility studies for alternatives to sending the AMS to the ISS by shuttle. One possibility would be to use a US or Japanese rocket to launch the AMS in parallel with a shuttle launch. After dropping supplies off at the ISS, the shuttle would pick up the AMS and deliver it to the station. This proposal, however, is running against the clock. NASA would have to start work immediately to be able to launch the AMS at the time of the last two shuttle flights, and it hasn't got the money, says Mark Sistilli, the NASA AMS project manager. Nonetheless, he insists, "We fully expect to receive AMS in December 2008 and get it ready for flight."

Another option would be to fly



At the heart of the Alpha Magnetic Spectrometer is a superconducting magnet that will produce a field 20 000 times stronger than Earth's.

CERN

In the clean room, Sam Ting (left), Senator Ted Stevens (R-AK; peering down), the DOE's Robin Staffin (standing, right), and others inspect the completed Alpha Magnetic Spectrometer's electromagnetic calorimeter.

the AMS directly to the Russian module on ISS on a European or Japanese rocket. Technically, such a mission is possible, says Sistilli; however, "all of the hypothetical non-US launch options would require major additional funding that does not exist in the NASA FY 2008 budget . . . and the Russian docking equipment would not come for free." The alternatives to sending the AMS to the ISS on the shuttle would add an estimated $380 million to $1 billion to the experiment's price tag.

Failure to fly the AMS would remove the only US-led major experimental apparatus planned for the ISS, about which congressional representatives are being privately briefed. And Ting and his entourage are not giving up. "The US government has an obligation to the international partners to find a way to fly AMS," says Ting.

"In addition to the sheer waste of effort and money, the damage to international collaboration in science will be the real legacy of [pulling out of the AMS]," says Barish. "Ting's international collaboration includes respected strong laboratories from around the world, and I hate to contemplate what they must now think of the US government and NASA."

Paul Guinnessy

Russian Academy of Sciences weathers round of attacks

Russian scientists say their academy's woes are symptomatic of a broader undermining of science in their country.

A power struggle in which the Russian government appeared poised to subjugate the Russian Academy of Sciences has relaxed, at least for now.

Founded in 1724 by Peter the Great, the academy has 400 or so institutes where the bulk of Russia's fundamental research is carried out. The academy has about 1200 members and more than 100 000 researchers and support staff in its institutes. Its annual budget of around $2 billion comes largely from the federal government.

In recent years the Russian government has been insisting on reforms in the academy. Things came to a head after new laws went into effect late last year requiring the country's president to approve the academy's choice of president and its charter.

Opposing reforms

At a three-day general assembly at the end of March, academy members adopted a charter under which they accept that the academy president must be approved by Russia's president. The academy has traditionally enjoyed independence. Even in Soviet times, says Vsevolod Gantmakher, who works in low-temperature physics at the Institute of Solid State Physics in Chernogolovka, near Moscow, "the academy was more democratic [than other organizations]—I think it was the only institution in the country where they elected their own leader, at least formally." What's new now, adds Isaak Khalatnikov, a founder and former director of the Landau Institute for Theoretical Physics in Moscow, "is that the academy is not completely independent. It has no right to finally elect its president." Still, he says, "it's difficult to imagine that a president elected by members of the academy would not