News & Analysis

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US told to invest in particle physics

America must boost its investment in particle physics if it is to stay at the forefront of the discipline. That is the conclusion of a National Academy of Sciences panel charged with recommending priorities for US particle physics over the next 15 years. The panel believes that the "intellectual centre of gravity" within the field is moving abroad and that, as things stand, within a few years most American experimental particle physicists will be working at facilities overseas.

Unusually, the panel consisted not only of particle and accelerator physicists but also other types of physicists, biologists, industrialists and policy experts. Many of the members of the "Committee on Elementary Particle Physics in the 21st Century" were previously unaware of what the committee calls the "challenge" facing the US in the field. Since the huge Superconducting Super Collider was axed in the early 1990s, the US programme has lacked focus, says the committee in its report, which was released late last month. Europe currently invests about twice as much in the subject as the US.

"The science on the horizon is very exciting," says panel chair Harold Shapiro, an economist and former president of Princeton University. "But the US programme in particle physics, unlike those in Europe or Japan, is at a moment when decisions

Fermilab

must be made about its strategic direction. It requires those in charge to take some thoughtful risks and make some thoughtful investments if they are to sustain the programme."

The committee says that America's top priority in particle physics should be to continue its active participation in the Large Hadron Collider, which is currently being built at CERN in Switzerland. As its next priority, the US should aim to become the world's leading centre for the development of the next huge particle machine, the International Linear Collider (ILC), which is due to come online in around 2015. According to the committee, the US should significantly expand its investment on R&D in the collider, to between \$300m and \$500m over the next five years. The panel also asserts

Staying in control
A major new report says Fermilab (above) would be a suitable site for the International Linear Collider.

The intellectual centre of gravity within particle physics is moving abroad

that the US should put forward an aggressive bid to host the ILC, and strongly implies that Fermilab should be the host. Shapiro notes that Fermilab has the infrastructure needed to host the ILC and that it will shortly become the only large laboratory left in the country that is devoted exclusively to particle physics.

The committee also says that an increased share of the US particle-physics budget should be spent on science at the interface with astrophysics and cosmology, in particular the direct detection of dark matter in terrestrial laboratories, precision measurements of the polarization of the cosmic microwave background, and measurement of dark energy's key properties.

In addition, Shapiro's panel recommends a coordinated international programme of experiments to determine the properties of neutrinos, and also suggests participation in "inexpensive, small-scale, high-precision" experiments to study physics beyond the Standard Model.

Given the current US budget deficit, it remains to be seen whether America can afford to carry out the committee's recommendations. Shapiro, however, is in no doubt of the importance of doing so. "For a nation the size and wealth of ours, it is important to take leadership," he says.

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Nuclear weapons

America seeks smaller nuclear stockpile

The Bush Administration is to reorganize its research into nuclear weapons with the aim of making the US nuclear stockpile smaller, safer and more secure. The plan, dubbed "Complex 2030", was unveiled at a Congressional hearing by Tom D'Agostino, deputy administrator for defence programmes at the National Nuclear Security Administration (NNSA). It is being seen as a solution to the call made by President Bush in 2004 to reduce the size of the country's nuclear-weapons stockpile by almost 50% by 2012.

The plan calls for the US to continue its Reliable Replacement Warhead Program, which aims to rebuild 125 of the country's

Downsizing
Bush intends to halve the US nuclear arsenal in the next six years.

nuclear bombs annually by 2022 as older, unreliable bombs are retired. The plan also envisions consolidating the nation's entire plutonium stocks into a single, yet to be determined, facility by the same date. Plutonium that is now kept at the Lawrence Livermore National Laboratory will be removed by 2014, while that at Los Alamos and other centres will be gone by 2022.

The administration regards Complex 2030 as simply an upgrading of – rather than a departure from – the US "stockpile-stewardship" programme, which involves maintaining the country's nuclear arsenal through computer

simulations that are supported by the results of lab experiments, not real explosions. Indeed, NNSA administrator Linton Brooks insists that "nothing at this time indicates the need for underground testing for the foreseeable future".

However, some critics fear that the project will weaken efforts to prevent the global spread of nuclear weapons. Others think that the plan is bound to lead to testing. "To pretend that [the government] will replace the existing nuclear weapons with new ones without testing is complete nonsense," says Jorge Hirsch, a physicist at the University of California, San Diego. "Once they have the new ones there will be a lot of pressure to test them. It is all very disingenuous."

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