correctors — each nearly one metre long and weighing 0.75 tonnes — magnifies it. The company estimates that the effect limits resolution by 0.45–0.75 Å, enough to explain why the second TEAM microscope was unable to beat its forerunner.

"It's a physical limit, so we really have to think hard" about how to solve it, says Ute Kaiser, an electron microscopist at Ulm University in Germany who directs Sub-Ångström Low-Voltage Electron Microscopy (SALVE), a €12-million project to build two pioneering microscopes. SALVE and CEOS are working together to redesign one of these instruments, currently under construction, to try to reduce the noise problem by moving the electron beam farther away from the troublesome materials.

But magnetic effects are not the only source of noise identified in recent years. In 2012, Ruud Tromp, a microscopist at Leiden University in the Netherlands, and his colleagues showed that modern aberration correction is intrinsically unstable, and that electrostatic or other types of noise cause blurring after only a few minutes[2]. Muller's group has shown that at current resolution limits, quantum-mechanical effects from electrons scattering off atoms in crystals can make imaged atoms seem larger or smaller than they really are[3].

Even with its current limits, the 0.5-Å TEAM microscope can do groundbreaking science. In April, physicist John Miao and his group at the University of California, Los Angeles, published the first atomic-scale images of crystal defects in a platinum nanoparticle[4]. Uli Dahmen, head of the US National Center for Electron Microscopy in Berkeley, where the microscope is housed, says that Miao's team is close to mapping nanoparticles in three dimensions. That would meet Feynman's ultimate goal of imaging materials atom-by-atom — even without achieving the resolution he called for. "I don't see anyone pressing materials-science problems that can be solved at 0.3 Å but can't be solved at 0.5 Å," says Dahmen. ■

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BIOMEDICAL RESEARCH

Outcry over plans for 'Japanese NIH'

Researchers fear reforms will bring cuts to basic science.

BY ICHIKO FUYUNO

Many people admire the US National Institutes of Health (NIH) as a model of how biomedical research should be funded. Japanese Prime Minister Shinzo Abe has taken that admiration a step further than most, with a plan to copy the NIH's structure. Much of the government's ¥320 billion (US$3 billion) in biological and biomedical research spending could come under the control of an institute that is set to start taking shape over the summer.

The plan, which came to light in mid-June with the publication of two government strategies, one on economic growth and one on health care, would mimic the centralized control of the NIH by consolidating management of research money for a range of research institutes (see 'All for one?'). But the plan also includes a goal to boost clinical applications, and many of the country's life-sciences societies fear that the institute would not emulate the part of the NIH that they most admire: its commitment to basic research.

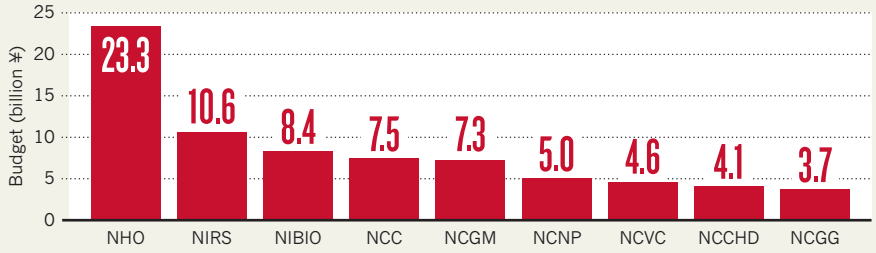
"I feel at odds with the concept," says Noriko Osumi, a neuroscientist at Tohoku University in Sendai and president of the Molecular Biology Society of Japan. "It lacks respect for scientists' free-minded creativity, which is the foundation of the country's scientific strength."

The idea of a Japanese NIH had been under discussion for at least a decade before being backed by Abe. One of its champions is Yasuchika Hasegawa, chief executive of the Osaka-based Takeda Pharmaceutical Company — Japan's largest drug company — who sees inefficiencies in how Japan's biomedical-research cash is currently managed. Three ministries independently allocate research funds with little coordination, says Hasegawa. He has complained publicly that "walls between ministries" have hampered the translation of basic research into therapies.

"In other countries there are organizations that bridge the gap between academia and industry," Hasegawa noted at a press conference of the Japan Association of Corporate

ALL FOR ONE?

Japan has a range of separate major biomedical research institutes, but their budgets could soon be put under the control of a proposed Japanese National Institutes of Health.



* NHO, National Hospital Organization; NIRS, National Institute of Radiological Sciences; NIBIO, National Institute of Biomedical Innovation; NCC, National Cancer Center; NCGM, National Center for Global Health and Medicine; NCNP, National Center of Neurology and Psychiatry; NCVC, National Cerebral and Cardiovascular Center; NCCHD, National Center for Child Health and Development; NCGG, National Center for Geriatrics and Gerontology

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JAY M. PASACHOFF/SCIENCE FACTION/GETTY IMAGES

Executives in Tokyo last November. "But it has yet to happen in Japan."

According to the economic-growth strategy, only two regenerative medicine products had been approved in Japan by December 2012, compared with nine in the United States and 14 in South Korea. Ryuichi Morishita, a gene-therapy specialist at Osaka University and one of the government's advisers on the proposals for the Japanese version of the NIH, agrees that the country needs more research translation. "Thanks to powerful political leadership, Japan is finally about to break the walls, a feat that has been attempted many times in the past but always ended in vain," he says.

But the government's plans came under fire from researchers before they had even been published. Days before the two strategies were approved by the cabinet, seven major life-science societies issued an emergency statement, calling for basic research to be supported. The next day, a further 54 bioscience associations warned that cuts to Grant-in-Aid for Scientific Research, Japan's main competitive funding stream for curiosity-driven research, would damage the country's ability to nurture the next generation of researchers.

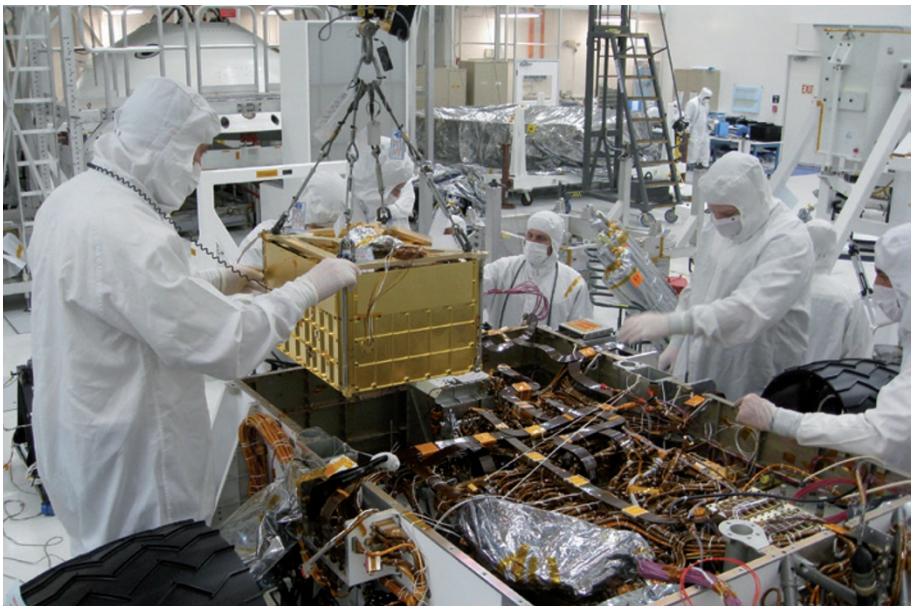
Officials have since sought to allay these fears. "We are aiming to produce novel drugs, medical technologies and therapies," says Shin Okuno, director of the Office of Healthcare Policy, the government body charged with implementing the healthcare strategy. "But it doesn't mean we don't understand the importance of basic science."

The strategies say that implementation of the proposal could start by the end of August, when the government will establish an internal administrative office to flesh out details such as the organization and budget of the body. Parliament is expected to pass a bill to establish the institute next year, allowing a launch as soon as 2015.

To avoid starting from scratch, one of Japan's existing medical-research institutes is likely to be turned into the main coordinating agency, with other institutes under its control. The Japanese NIH's top priority will be cancer research, but the institute will also focus on areas such as regenerative medicine, dementia, next-generation vaccines and diseases such as atherosclerosis.

The speed with which plans are moving has worried many senior researchers. Tetsuo Noda, president of the Japanese Cancer Association in Tokyo, largely agrees with the idea of centralizing the budget for research on human health and diseases, but warns that scientists have not been widely consulted. "It was a bit of a hasty move," he says. "There's a top-down approach, with government officials working on a vague concept. That won't lead to an excellent medical-research system." ■

NASA



Equipment made by Creare, an SBIR grant recipient, is loaded into the Mars Science Laboratory rover.

FUNDING

US research firms put under pressure to sell

Commercialization rules threaten to curtail SBIR grants.

BY EUGENIE SAMUEL REICH

The offices of Physical Sciences Inc. (PSI), a small scientific research company in Andover, Massachusetts, feel not too dissimilar from a technical university. The brick and glass building boasts an atomic oxygen chamber for testing how new materials act in outer space, as well as a next-generation ophthalmic device that makes high-resolution maps of the retina. Chief executive Dave Green looks like an academic as he hangs out in the atrium wearing a baseball cap; the only sign that he operates a for-profit business is the shirt and tie that hide beneath his zip-up sweater.

PSI, in fact, is not much of a commercial operation. Most of its revenue comes from research performed for larger companies and the government, and nearly one-third of it, US$10.5 million, comes directly from a single federal source: the US Small Business Innovation Research (SBIR) programme. According to guidance from the Small Business Administration, which oversees the programme, the grants are supposed to lead to commercial activity and are not merely to fund long-term research operations. However, an analysis by *Nature* of government data suggests that the top award winners are research-focused companies such as PSI that do not sell products, and many companies depend on SBIR funding, year after year, for a large part of their revenue stream (see 'Small business, big awards').

That era may be about to end.

The SBIR programme is based on the requirement that government agencies set aside 2.7% of their research budgets, about $2 billion per year in total, for grants to small businesses. In 2011, Congress reauthorized it for another five years but added requirements that the Small Business Administration track the outcomes of the grants. To facilitate this, the administration issued policy guidelines last year requiring agencies to monitor commercialization more closely. A set of benchmarks for doing so were due out on 1 July, although they have been delayed owing to employee turnover, according to a Small Business Administration spokesman.

If the benchmarks have any teeth to them, companies such as PSI, which has never brought a product to market in its 30-year history of winning SBIR awards, will struggle. "The explicit commercial side of it, if it's really enforced, is going to cause problems for companies like us," says Greg Zacharias of Charles River Analytics, a research and development company in Cambridge, Massachusetts, that won 44 SBIR awards worth a total of $8.8 million in 2011.

It is not as if these research and ▶