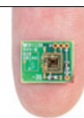


THIS WEEK

EDITORIALS

MADDOX PRIZE The first award-winners who stood up for science **p.160**

WORLD VIEW What the new leadership in China means for research **p.161**



EAR PLUG Tiny chip generates electricity from audio power **p.162**

Ignition switch

The US National Ignition Facility has so far failed to generate fusion energy, but repurposing it as a tool to study nuclear weapons and basic science could be its saving grace.

On a breezy day in 2009, action star Arnold Schwarzenegger, then governor of California, took to the stage to dedicate the National Ignition Facility (NIF), the world's most powerful laser. "I can see already my friends in Hollywood being very upset that their stuff that they show on the big screen is obsolete," the governor quipped in front of the recently completed facility, which uses lasers to squeeze fusion energy from a tiny pellet of hydrogen fuel. "Fusion energy may be exactly what will power future generations on the globe," he added.

Fast-forward three years and the script is somewhat different: the lofty hopes of Schwarzenegger and other politicians who attended the ceremony that day seem less realistic. At the end of September, officials at Lawrence Livermore National Laboratory (LLNL) in Livermore, California, where the NIF is based, announced that the facility would miss a crucial milestone to produce ignition — releasing as much energy from fusion as is supplied by the lasers. After an intense, six-year effort, the facility remains a factor of ten away from that goal. In the coming weeks, LLNL scientists are expected to lay out an alternative, much longer, path to ignition, while senior officials refocus the laser's work (see page 170). For now, thanks in large part to the NIF's role in nuclear-weapons science, politicians will allow the research programme to trundle on at a cost of US\$280 million per year. But the great unfulfilled promise of the NIF should serve as a cautionary lesson for scientists who promote Hollywood solutions from their research.

The NIF is a jaw-dropping piece of technology. It trains 192 separate laser beams on to a capsule of hydrogen fuel a few millimetres long. The power from the lasers compresses the fuel until it fuses, creating energy from the mass of the hydrogen isotopes. The NIF's goal is to produce break-even energy from this fusion — no mean feat, considering that the input energy can be up to 1.8 megajoules.

In 2005, the LLNL and the US National Nuclear Security Administration, which oversees the lab, laid out a plan to reach the break-even point. The National Ignition Campaign, which kicked off the following year, aimed to bring the fledgling facility up to full power, kit it out with diagnostics and perform a series of tests on its hydrogen fuel. Tellingly, the original plan does not commit the lab to reach ignition, but instead called for "a credible ignition experimental campaign".

But during the past six years, expectations around the NIF have grown well beyond that credible campaign. In many ways, the lab itself is to blame for the unrealism. Lab officials gave tours to prominent politicians and journalists in which they promised a lot more than just ignition. The NIF, they claimed, was the first step on the road to potentially unlimited fusion energy. In support of their dream, LLNL scientists developed a prototype for an electricity-producing reactor that they hoped would gain financing once ignition was achieved.

But problems were mounting even as the lab eagerly promised clean, cheap electricity. Outside reviewers noted that the hydrogen fuel was not being compressed properly. The computer codes used to predict the facility's performance were themselves operating badly. Privately,

most people familiar with the programme had known for more than a year that the NIF could not reach ignition in the time allowed. Yet the LLNL stubbornly insisted that it might yet meet its goal. Enthusiasm gave way to saving face, as the leadership struggled to hold the line and keep up the appearance that all was going well.

Fortunately, this is not the end of the NIF. In addition to carrying the far-off promise of clean energy, the facility also mimics the physics of nuclear weapons. Scientists at the lab will now use it to address

"The line between optimism and overselling is a thin one that can too easily be crossed."

questions about the ageing US nuclear stockpile. The lasers can provide physicists with an invaluable tool to study how materials behave at enormous temperatures and pressures — similar, say, to those in Earth's interior. Despite the bluster of some at the lab, politicians have always recognized the value of this work, and they are willing to continue funding it for now.

The size and cost of the NIF make it an easy target for criticism, but those working there are hardly alone in their hubris. From stem cells to materials science, researchers around the globe make daily headlines with bold claims about what can be done in their fields. Politicians and the public, eager for solutions to the world's many problems, embrace their words. The process is often healthy: scientists insert caveats, and citizens are given a vague sense that things may not work out. But striking the balance between enthusiasm and conservatism can be difficult. The NIF reminds us that the line between optimism and overselling is a thin one that can too easily be crossed.

Pride comes before a fall. Now the NIF has to find its feet all over again. ■

Science aid

Donors and African governments must invest in advanced science and maths education.

Of the eight United Nations Millennium Development Goals — the flagship international-development targets that world leaders set themselves for 2015 — none addresses how to improve education beyond the primary level.

Increasing literacy, eliminating hunger and reducing child mortality are all laudable goals and they have rightly been the focus of global development policies, especially in Africa. But the failure to consider secondary education, and beyond, as a development issue is an oversight. And it is a blind spot shared by Western donors,