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Bioengineers debate use of military money

US Department of Defense's call for greener ways to make explosives worries synthetic biologists.

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J. Sunderman/US NAVY

The production of explosives such as nitrocellulose, used to fire shells, could be aided by synthetic biology.

By transforming microbes into miniature chemical factories, synthetic biology could lead to cheaper medicines, greener fuels and, to the distress of some in the field, cleaner weapons. Last month, the US military asked synthetic biologists to look for more environmentally friendly ways to manufacture explosives, prompting a round of soul-searching about the field's dependence on defence dollars and whether some applications should be off-limits.

A 'statement of need' from the Strategic Environmental Research and Development Program (a partnership between the US Department of Defense, Department of Energy and the Environmental

Protection Agency) calls for research on adapting biological systems so that they can be used in place of the current chemical methods for making explosives, which can involve toxic compounds such as heavy metals.

But manufacturing munitions is anathema to some scientists. “I can’t look my kids in the eyes and tell them my ideas are being tossed around by generals. I’d rather they were thrown around by doctors or global-health researchers,” says Eric Klavins, a synthetic biologist at the University of Washington in Seattle.

The ‘green explosives’ project also highlights a broader debate. “We need to figure out what the right relationship is between the worlds of defence and synthetic biology,” said Drew Endy, a bioengineer at Stanford University in California, at a defence-science conference in Las Vegas last week convened by the defence department’s Defense Threat Reduction Agency in Fort Belvoir, Virginia.

Synthetic biologists have struggled to get much support from traditional biology funders, such as the National Institutes of Health, because they tend to regard the field as an engineering discipline, says bioengineer Pam Silver of Harvard Medical School in Boston, Massachusetts. They have therefore relied heavily on funding from the defence and energy departments, as well as the National Science Foundation.

Investments made by the Office of Naval Research during the 1990s, for instance, laid the foundation for the field, and the Defense Advanced Research Projects Agency (DARPA) in Arlington, Virginia, is set to award a series of contracts under its new synthetic-biology programme, called Living Foundries.

Few of the military investments to date have been targeted at offensive applications, however. Jim Collins of Boston University in Massachusetts, for example, has been awarded US$1.5 million a year for 5 years by the Office of Naval Research to develop what he calls “microbiorobots” — reprogrammed bacteria that are able to sense materials in the environment. These robots might eventually be used to detect underwater mines, for example, but Collins has a simpler goal: to demonstrate that living systems can be melded with electronic devices. Linda Chrisey, who manages the programme that awarded Collins’s grant, points out that the Geneva Conventions forbid signatories from funding work that could facilitate the development of biological weapons.

But some researchers are uncomfortable receiving military funding — including the steering committee of the Critical Assessment of Genetically Engineered Networks, which aims to stimulate the field through a series of competitions and is sponsored by the W. M. Keck Foundation in Los Angeles,

California. The committee decided not to apply for DARPA funding this year after committee member Klavins objected. “I understand that everything has a dual use. But who funds the ideas often determines which uses come first,” says Klavins.

Roger Brent, of the Fred Hutchinson Cancer Research Center in Seattle, argues that although previous military-funded programmes in synthetic biology may not have had direct offensive uses, this is not the case for the green explosives call. He says that the field needs to decide whether it is prepared to follow other academic engineering disciplines, such as robotics, which have become heavily reliant on military funding and are involved in projects that have been used in warfare. “This could provide a good opportunity for the field to debate within itself whether this is a good direction to go in,” says Brent.

And debate they will. Andrew Ellington of the University of Texas at Austin, who advises the Defense Intelligence Agency and holds grants from DARPA and the Office for Naval Research, says that the idea that scientists should not work with defence funding relies on a “1960s paranoid view of the military”. He argues that if the United States is going to make weapons, it might as well make them using less-toxic processes. “You can have someone die because of the way we currently prepare munitions,” he says, “or you can put in proposals to try to make it easier and safer and greener to make munitions.”

Ellington adds that some of his projects — such as developing environmental sensors to detect mines — could even save lives. “I’m proud of the work I do. I’d like it if something we did someday kept somebody from getting blown up.”

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