LETTERS TO THE EDITOR

On the Mathematization of Warfare and the Militarization of Mathematics

All mathematics is divided into three parts: cryptography (paid for by CIA, KGB and the like), hydrodynamics (supported by manufacturers of atomic submarines) and celestial mechanics (financed by military and by other institutions dealing with missiles, such as NASA).

—Vladimir Arnold, 1999

This statement by the well-known Russian mathematician was an overstatement, but also carries some truth. Intelligence, military, and government agencies have financed whole branches of mathematical research. During the Cold War, for example, the Defense Advanced Research Projects Agency (DARPA) supported large research groups like MAC (Mathematics and Computation) and the Artificial Intelligence Lab at MIT.

At the same time, military funding also influenced directions in mathematics research. Questions on the tactical and technical aspects of warfare were very present amongst researchers and applied mathematics like control theory, optimization, and the basics of cryptology gained more and more popularity.

That was decades ago. How are mathematics and the military connected today?

Wars today are fought in cyberspace via the media, with spy satellites, and with remotely operated drones—tactics that depend heavily on theoretical foundations in various subjects, particularly mathematics. Number theory is central to cryptography, optimal control underpins guidance of cruise missiles and drones, and stochastics and dynamical systems permit handling uncertainty in urban warfare. Many of these applications continue to be funded by military and intelligence agencies.

There is also marked influence in higher education. For one, military applications are mentioned in courses given at colleges and universities. But military and intelligence agencies and arms manufacturers also bond with students early on through well-paid internships, co-op programs, and summer camps. This early contact helps position military stakeholders as attractive employers to young mathematicians and allows them easy access to student knowledge.

Modern, hybrid warfare has some drastic impacts on today's society. These include attacks on citizens' privacy via increased surveillance and reconnaissance techniques as well as influencing the public dialogue through propaganda and strategic communication. There is also physical harm, for example when civilians are injured and killed in drone attacks. Battlefields have thus expanded into civil society.

Mathematics is a resource that fuels modern warfare. This raises questions that the mathematics community should address. How important is military support to contemporary mathematics? How do military applications influence mathematics research? And to what degree are we responsible for the uses to which our subject is put?

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