Why should we help politicians to wage war?

Scientists should not fool themselves that their work for the military has ethical benefits.

Sir — Your Editorial "Hope for best, prepare for worst" (*Nature* **423,** 101; 2003) was characteristically illuminating. Given the depressing situation in which the world has been left following the war on Iraq, it is quite reassuring to learn that a strong competitor to President Bush for the title of 'world's scariest' has surfaced in the person of North Korean President Kim Jong-Il.

The Editorial recommends that we scientists should pay special attention and search our own consciences: "scientists in East Asia should be thinking about how they might be involved". The good news, apparently, is that US scientists, "since the Manhattan Project", have become engaged in the international military thinking of their governments. The new danger, you say, is that, in Asia, "scientists are adopting the attitude that war is something for the government to deal with" and adopting the view "don't let political considerations skew your objectivity; focus on your research; be driven by pure curiosity".

You state that American scientists, since the Manhattan Project, have behaved ethically (if not always successfully) in trying to influence the use that is made of their work. Could you give some examples? Was the large-scale defoliation in Vietnam a success for biologists or ecologists? Is the use of depleted uranium, now so popular in US munitions (for example, in Serbia, Afghanistan and Iraq), an ethical achievement by physicists? Is the dropping of 2,000-pound bombs in residential neighbourhoods due to "leading chemists"?

It is unfortunate that you present India and Pakistan as positive examples of the involvement of scientists in military development. Both countries parade nuclear weapons in the service of rather unbecoming nationalistic and bigoted politics. No dissent by "leading scientists" has become publicly known. And should one mention Israel?

It would also have been helpful had you explained the advantage of involvement by "leading researchers" in military circles. Is this necessary because of the need for ever more sophisticated weapons? Or is it because non-leading scientists may have less ethical backbone? Indeed, could the threat of participation by "those much less qualified" have led to a somewhat better score?

The main disadvantage you ascribe to Asian scientists' unwillingness to be involved in military work — since "military preparations require science-based research and development, from the analysis of an enemy's capabilities to the design and production of weapons" — may be their inability to provide the sophisticated tools that are necessary to inspect and destroy the weapons of some future enemy, and then to decimate the presumed enemy with laser-guided cluster bombs.

Luckily, the threat posed by the attitudes of Asian scientists is reduced, mainly because — following the wars on Serbia, Afghanistan and Iraq — international institutions such as the United Nations, the United Nations Security Council and the Geneva Conventions are no longer available for destruction. Should the current 30 months of war on Palestinian autonomy be thrown into the deal? Was it perhaps the 'ivory tower' attitude of Asian institutions of science and culture which prevented any sign of alarm being shown at the devastation of international order? This silence has been particularly deafening in contrast to the persistent and principled stands that have been taken by all the western religious institutions, at their highest levels.

There is in fact a strong case for the opposite attitude, for lauding those who carry on research for "the glory of God", beautifully articulated by Sir Michael Atiyah in his address concluding his term as president of the Royal Society in November 1995. "In this semi-political world … we [the scientific community] are in danger of losing our way and our identity. The scientific ethos becomes increasingly hard to discern. Scientists are too often thought of as a sinister part of the establishment."

In a world in which rising public opinion is considered by the *New York Times* to be the second world power, science should be better advised — not least when one peruses such 'academic' projects as Massachusetts Institute of Technology's Institute for Soldier Nanotechnologies (see http://web.mit.edu/isn).

Daniel Amit
Racah Institute of Physics, Hebrew University, Jerusalem, Israel, and Istituto di Fisica, Universita' di Roma, La Sapienza, Ple Aldo Moro 2, 00185 Rome, Italy

DNA discoveries through crystallography

Sir — During the years that followed the discovery of the DNA double-helix structure, whose fiftieth anniversary is currently being celebrated (see www.nature.com/nature/dna50), a wealth of fibre diffraction studies were carried out (reviewed in ref. 1).

However, the atomic details of the double-helical structure could not be confirmed until chemically pure oligonucleotides became available in the 1970s and allowed the study of single crystals.

An important breakthrough was the crystallization of an RNA mini-helix[2]. Oligonucleotide crystallography has provided valuable information and unexpected discoveries, yet there is plenty of scope for more.

The two first DNA model structures that were determined produced more surprise than confirmation. The first of these[3,4] was published on 22 June 1978, obtained from d(ATAT) and showing only parts of a double helix in a rather complex crystal structure. A year later, the second structure[5] uncovered left-handed DNA. It was only in 1980 that the right-handed double helix proposed in 1953 could be seen in atomic detail[6].

Since then a wealth of crystallographic data have fully confirmed the double-helical nature of B-form DNA and the Watson–Crick pairing of the bases in this and most other forms of DNA.

In 1979 Z-DNA was discovered, followed by quadruplexes, Holliday junctions, Hoogsteen pairing and others, as detailed in the nucleic acid database (http:// ndbserver.rutgers.edu). This database has been recently improved, and provides images of any available structure.

Some may think the field is mature, with the structures of more than 600 deoxyribonucleotides known. Yet these data are extremely limited; for example, only two structures have been determined with only AT pairs — most structures are rather CG-rich. Some sequences are easier to study, and so about 85% of crystallized B-form DNA models start with cytosine.

Juan A. Subirana
Department of Chemical Engineering, Universitat Politecnica de Catalunya, Diagonal 647, Barcelona 08028, Spain

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