

Response

Unresolved issues suggest that the cardiovascular physiology of crocodiles is as complex as it is understudied. The situation underscores the desirability of further research rather than further exegesis of existing literature.

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U.S. National Missile Defense: Looking at the Whole Package

The recent technical objections to the U.S. National Missile Defense system by a study group of the Union of Concerned Scientists (UCS) (1) (ScienceScope, "Hit or missile?", 14 Apr., p. 243) and by several independent researchers (News Focus,

"Researchers target flaws in ballistic missile defense plan" by D. Malakoff and A. Cho, 16 June, p. 1940) are missing the point: The planned system will not operate just on its own, but will rely for warhead/decoy discrimination on information supplied by a number of complementary systems and use the interceptor's on-board sensors mainly for homing on a designated target. It is critical to discuss these complementary systems as well, not just the limited discrimination capability of the system under consideration for approval by President Bill Clinton this fall.

Four major passive or active discrimination techniques—radar and infrared detectors, and laser and particle beams—were evaluated in a report from the American Physical Society (APS) study group on the status of the science and technology of directed energy weapons (2). According to the APS study, the best potential for discrimination is offered by interactive high-energy beam techniques, techniques that are not even mentioned in the UCS report. In this area, one of the most important advances in the past 10 years has been the development of superlasers (3, 4); that is, the invention of "chirped pulse amplification," which increases the instantaneous power of

lasers by a factor of 1 million. Such power enables tabletop lasers to produce nuclear reactions directly (4) (see also *Science*, 2 Apr. 1999, p. 35). Superlaser beams combine the ease in steering and focusing of optical laser beams with the capacity of particle beams to generate high-energy secondary particles in distant targets, which gives them the ability to "x-ray" remote objects and discriminate as to whether they are warheads or decoys.

The political implications of ballistic missile defense are of such a magnitude that it is important that any technical assessment should be as accurate and comprehensive as possible—including a serious evaluation of the prospect of all existing and emerging warhead/decoy discrimination techniques.

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References

1. A. M. Sessler *et al.*, *Countermeasures* (Union of Concerned Scientists, Cambridge, MA, 2000).
2. N. Bloembergen *et al.*, *Rev. Mod. Phys.* **59**, S1 (1987).
3. A. Gsponer and J.-P. Hurni, *Fourth Generation Nuclear Weapons* (IANUS, Darmstadt Univ. of Technology, Germany, 1999).
4. G. A. Mourou *et al.*, *Phys. Today*, 22 (January 1999); J.-M. Hopkins *et al.*, *Sci. Am.*, 54 (Sept. 2000).

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