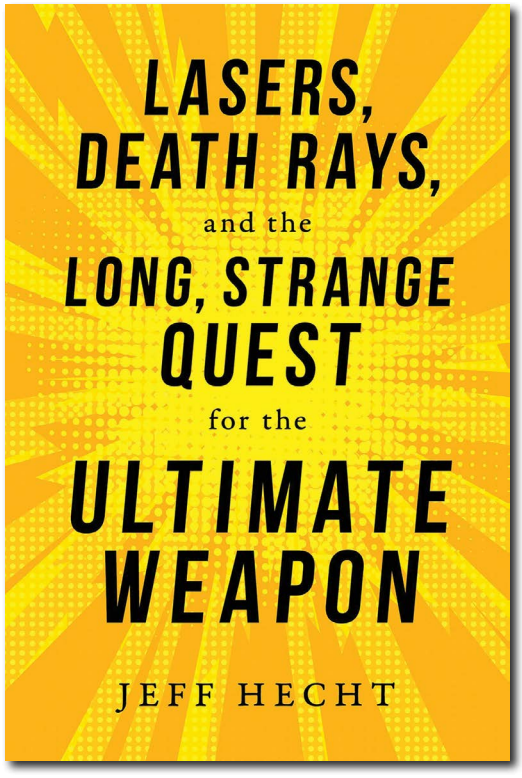
REVIEW ESSAY



Lasers, Death Rays, and the Long, Strange Quest for the Ultimate Weapon

Edited by Jeff Hecht, Prometheus Books, Amherst, New York, 2019, 303 pages

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Today, lightning fascinates us, just as it did the Greeks and others in the past who were mesmerized by its luminous, raw power. Though the ancients did not understand lightning, they almost certainly feared it. To many of them, it seemed an awesome force hurled down by annoyed gods at particular mortals. Among those observers, a few probably marveled at the idea of barraging enemies with bolts of similar intensity. Many, many centuries later, we now know the cause of lightning, yet we still remain in awe of it. Such an instantaneous power, were it to be controlled and focused, would be a colossal leap in both offensive and defensive capabilities. Undoubtedly, that explains—or goes far in explaining—the tireless devotion of a stream of advocates and scientists in what they fervently believed might be "the ultimate weapon" in the form of a concentrated beam of light: a laser, as captured in the pages of Jeff Hecht's book, *Lasers, Death Rays, and the Long, Strange Quest for the Ultimate Weapon*.

Hecht takes us on a trek dating back a millennia, cataloging the determined efforts of a host of visionaries who saw in those bolts of energy the possibility of making war—as it existed then—obsolete in the face of a force

so powerful, instantaneous, and nimble. And that is what the lion's share of this book aims to chronicle, the quest for a laser weapon that could smite all comers and unleash unbelievable power in the hands of its master. Of course, the devil, as usual, is in the details. In the case of lasers (invented in 1960), the details really boiled down to cost, control, power, and transportability.

The concept of the laser, or "death ray," dazzled the imagination in science fiction books, radio programs, television shows, and movies long before any practical application emerged. Oftentimes, unbridled enthusiasm was a hallmark of the field, as was profligate spending. One could say the military was obsessed with the concept. Despite countless false starts, the dream of an ultimate weapon stubbornly persisted, propelling numerous physicists' and engineers' ambitions. Over the decades, since 1960, failures certainly outnumbered successes and proved costly. But faced with an existential threat, paranoia, and not much of an accounting leash, lasers continued to transfix military futurists, the promise potentially unlocked with the addition of just a few billion more dollars.

At the height of the Cold War, nuclear weapons carried aloft on intercontinental ballistic missiles (ICBMs) were able to hit their targets in thirty minutes or less; they represented an ultimate threat to humanity. Not surprisingly, a great interest in developing a laser strong enough to penetrate the casing around these ICBMs and render them inert was catalyzed and sustained. In effect, lasers could become the ultimate defensive weapon, trumping the nuclear bomb itself.

One of the elemental difficulties with laser weapons is the fact that targets move, sometimes several times the speed of sound and at a substantial distance. The author does well spelling out for the nonscientifically inclined among the readership important points about lasers designed as weapons. Drawing upon the ICBMs example again, Hecht reminds us that targets struck by a beam of light do not instantly explode; instead, a laser beam has to remain focused on the same, small surface area long enough (at least several seconds) to destroy the surface or components within. This was, in fact, the idea behind the Strategic Defense Initiative (SDI), or *Star Wars* concept, that was advocated by the Reagan administration beginning in 1983 and intended to swat down inbound Soviet missiles while transiting space en route to their targets. Of course, like so many projects before it, the ambitions outstripped the perfected science. SDI was canceled a decade later, but this had as much to do with the collapse of the Soviet Union as it did with the exorbitant cost. Another intriguing venue, the Airborne Laser System, held promise for dealing with limited launches by a rogue state. Unfortunately, it too was hobbled by logistical difficulties and eventually suffered the same fate as SDI.

Conversely, industrial lasers—where significant progress has been registered—burn holes in metal, slice human tissue, or actuate devices only inches away from the beam. Though early lasers proved too feeble to become actual weapons, they served as keys to unlock far greater accuracy in conventional weapons that, by default, increased the lethality of conventional munitions. But while little feasible progress was being made in converting light into a weapon, lasers were making enormous strides in nonmilitary venues, revolutionizing various industries (e.g., entertainment and communications, cutting tools, medicine). Ironically, steady progress in those areas has now led to insights and enhancements applicable to laser weapons that could potentially negate insurgent rockets and rogue missile launches.

All that said, along the bumpy path toward spending billions, many technical problems were, indeed, solved—sometimes replaced by others of a different character—and lasers became more potent, efficient, and portable. Beginning in 1995, the United States began collaborating with the Israeli government on the development of laser-based missile defense from ground vehicles. Given it did not involve space or aircraft, the project proved more workable. More recently, as one can see in numerous YouTube videos, laser beams can now annihilate small boats, drones, and vehicles. So maybe the future is bright for lasers in terms of weaponization, but, if the past is prelude, significant hurdles remain, not the least of which includes deployment of a workable and affordable system. One issue, the growing space debris problem in low-Earth orbit (and the constraints that

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entails), could conceivably be ameliorated, if not solved outright, through the application of laser technology at some point but only time will tell.

Hecht patiently sketches a backdrop of peculiar characters, wild and fantastical schemes, and the occasional, albeit super expensive and elaborate invention. As he does so, the painstaking evolution of laser technology emerges, at once both gnawingly frustrating and tantalizingly intriguing.

Hecht deserves credit for his compact attempt to shed light on a very technical subject. Notably, some of his chapters are more digestible than others, particularly the ones laden with acronyms galore and filled with jargon. It is clear Hecht revels in the absurdities and technicalities of the subject, having spent many years writing about it. Sometimes, though, his writing becomes untethered, almost giddy, and runs in an unnecessarily technically laden direction, making it a tough read for novices who are more interested in a survey of the whole rather than the fine details. Still, it is a worthy addition to any collection covering military innovation. ■