

The Morality of Art and Science

by Neal R. Wagner

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Part I. Building the bomb

A Hydrogen bomb always has a small atomic bomb as a trigger, setting off the larger bomb somewhat like a cap detonates a bundle of dynamite. Besides the vast disparity of energy there is a critical difference between the two triggers: the trigger for a Hydrogen bomb utilizes a ingenious indirect mechanism discovered in a flash of creative insight by a young Polish-born mathematician, Stanislov Ulam. What a curious similarity—Ulam's idea, injected into the nuclear weapons program, behaved somewhat like the fission trigger for a fusion device, or like the initial neutron that leads to a cascade of neutrons in a fission explosion. Work on the Hydrogen bomb proceeded rapidly, involving ever increasing numbers of people, culminating in success. Ulam's great insight rescued a weapons development project mired in failure, and it created an arms race.

Should Ulam have used his creative genius to make a bomb? The temptations are considerable—not just the renown, prestige, and wealth that laymen expect, but the thrill of a truly new discovery. Even I have had such a thrill, though it was a false hope and a stillborn discovery. Ulam had no thought of suppressing his idea, but in his later years he produced rationalizations for his actions.

If I think back to my own youth, I seem always to have known how to make an atomic bomb. Oh, not the details, but the basic method: Obtain Uranium 238 by separation from the far more plentiful Uranium 235, or perhaps obtain Plutonium from a Uranium reactor. With enough of either material in hand (the exact amount being secret), put shaped explosives all round to compress the material and set off the explosion. (Alternatively fire a hemisphere of the material down a shaft onto another hemisphere.) References also mentioned some source of neutrons injected as a trigger. Very rough ideas, with many details missing, but still no additional tremendous insights needed. It was said that just amassing the fissionable materials was by far the hardest step, although it turns out that the details of the implosion method are extremely tricky.

As a youth I failed to notice that no such explicit descriptions accompanied stories about the hydrogen bomb. One only learned which materials were needed—some combination of Deuterium or Lithium or Tritium. I pictured a batch of fusion-ready matter with an atomic bomb trigger at its center.

Much later, and no longer a youth, I heard that there was some great secret to making a hydrogen bomb. Our ultimate bomb-making secret, that the young Pole had supplied, that the Russians stole. Later yet I heard there was a debate among the many people who knew this secret. This idea could be expressed as a single simple sentence understandable by laymen and known to half the physicists on the planet. No reason to keep it secret

anymore.

In 1983, our government declassified the secret, and a fascinating idea it was. To quote a recent description: Ulam's contribution "emerged from a closer look at the ... fission fireball, which initially radiates most of its energy as X rays. These, traveling at the speed of light, advance outward ahead of any shock wave." Previous designs "tried to pack the entire mass of thermonuclear material into the evolving fission explosion to heat it hydrodynamically," but "those designs always promised to blow apart before thermonuclear burning could make much headway." Ulam saw that "if the thermonuclear materials were *physically separated* from the fission Primary, the enormous flux of X rays coming off the Primary might be applied somehow to start thermonuclear burning in the brief fraction of a second before the slower shock wave caught up and blew everything apart." (See Reference 1.)

That's it, Ulam's great idea. Further creative discovery was needed to complete a bomb, but the project immediately shifted from more than a year of failed attempts to rapid progress.

In his autobiography, Ulam gave justifications for his actions. He started by picturing the weapons race of the future. "After the war . . . I was in favor of continuing strong armament policies if only not to run the risk of being overtaken by other nations." (All quotes are from Reference 2.)

He said he was realistic about controls of these weapons: "I thought it was naive to expect that the wolves would lie down with the lambs and felt that meaningful international agreement would take many years."

But he admitted he hadn't foresee all the implications. "I failed to realize fully the immense importance of nuclear armament and the influence it would have on the course of world events. One bomb, I told myself, was equal to a thousand-plane raid. Yet I did not realize that the power of each such bomb could be still vastly increased, and that it was possible to manufacture thousands of them."

And his own mind was as ease: "I felt no qualms about returning to the laboratory to contribute to further studies of the development of atomic bombs. . . . I followed my instincts (or perhaps my lack of instincts) and was mainly interested in the scientific aspects of the work. . . . Perhaps I also felt that technological sequels to scientific discoveries were inevitable. Finally I trusted the ultimate good sense of humanity."

Like so many other scientists, he found further rationalizations: "I always felt that it was unwise for the scientists to turn away from problems of technology. This could leave it in the hands of dangerous and fanatical reactionaries." Here Ulam's statements hardly made any sense. Did he imagine that these reactionaries could build a bomb themselves? Did the scientists retain any control of events?

Writing about the time just before his great idea, at a low point in the project, he said, "I wrote to [the associate director] that one should continue at all costs the theoretical work, that a way had to be found to extract great amounts of energy from thermonuclear reactions." This sounds like a fanatic to me. In fact the whole weapons program was a sea

of jealousies, in-fighting, and repeated failures. Ulam was scarcely on speaking terms with the director (Edward Teller) to whom he first related his idea. Teller went on to become the world's foremost weapons promoter, continuing even in recent years with his support for the failed X ray laser portion of the Strategic Defense Initiative.

Finally Ulam gave what he claimed were his true reasons: "Contrary to those people who were violently against the bomb on political, moral or sociological grounds, I never had any questions about doing purely theoretical work. I did not feel it was immoral to try to calculate physical phenomena. Whether it was worthwhile strategically was an entirely different aspect of the problem—in fact the crux of a historical, political or sociological question of the gravest kind—and had little to do with the physical or technological problem itself. Even the simplest calculation in the purest mathematics can have terrible consequences. Without the invention of the infinitesimal calculus most of our technology would have been impossible. Should we say therefore that calculus is bad?"

"I felt that one should not *initiate* projects leading to possibly horrible ends. But once such possibilities exist, is it not better to examine whether or not they are real? An even greater conceit is to assume that if you yourself won't work on it, it can't be done at all. I sincerely felt it was safer to keep these matters in the hands of scientists and people who are accustomed to objective judgments rather than in those of demagogues or jingoists, or even well-meaning but technically uninformed politicians. And when I reflected on the end results, they did not seem so qualitatively different from those possible with existing fission bombs. After the war it was clear that A-bombs of enormous size could be made. The thermonuclear schemes were neither very original nor exceptional. Sooner or later the Russians or others would investigate and build them. The political implications were unclear despite the hullabaloo and exaggerations on both sides: that single bombs were able to destroy the largest cities and could render all-out wars less probable than they were with the already existing A-bombs and their horrible destructive power."

I have quoted at such length to show the complete statements that Ulam made on this subject. It sounds good, even sincere and convincing, but it is all just rationalization, after the fact. It's abundantly clear the Ulam was a scientist who was thrilled to work on these problems. They were interesting. He did not at the time consider the true implications. He never thought about withholding his talents. He talks of finding safety by leaving these matters to the scientists, yet in fact the scientists simply supplied the technology.

Part II. A Personal Account

In my own case I was educated as a mathematician, concentrating on pure mathematics without applications. No possibility occurred to me of my professional activities causing harm. I blissfully continued work, while switching to computer science and to more applied problems. The remote possibility of fame from some scientific discovery has only receded with the years.

But there is now a chance of general societal harm, albeit very unlikely, from another

quarter. I have long toyed with ideas for various books, mostly novels. My favorite is the oldest idea, the most autobiographical—in a way the most honest of all the work I’ve considered. It would be the personal story of a tormented man who tries to kill off a good fraction of the race. I’m not tormented like this protagonist, but I understand him, I mean really *understand* him. When I’m in a weird mood, I think I should write the book to keep from actually going ahead with the “project”.

So far I haven’t been very convincing, but I think I could convince, for this is honest stuff, from within myself. I would set up the story by letting a protagonist present himself: tortured, alienated, lonely, angry. Like me in some ways, only greatly exaggerated. He will talk about feeling like a member of some non-human species, trapped on earth. In the opening I will have him contemplate suicide, and shortly afterward he will explain to acquaintances how to commit a rape—an act he of course has never done, would never do. This explanation comes because someone has blamed the victim of a rape, saying she should have resisted. He will calmly describe how one would threaten and intimidate, but his friends will refer to the incident for weeks. (“He taught us how to commit rape.”) His beloved sister will die, and he will blame it on overpopulation, too many people. Over time he will slip into this frame of mind: too many people—something must be done.

But what, what to do? I’ll have him read all sorts of books. Finally he will fix on pneumonic plague. He is a scientist, but not a biologist. Nevertheless an intelligent, careful person, who will spend years on this goal: the once-and-for-all disaster of world-wide pneumonic plague.

My protagonist will be unmarried, but my wife once told me about borderline personalities—individuals quite sane and reasonable in all areas but their own fixation. I understood her description immediately, intuitively, completely. My character will consider most terrorists, criminals, murderers and other antisocials as dangerous people, to be avoided if possible. He wouldn’t step on a bug, wouldn’t *think* of harming an *individual*, yet he will plan mass destruction of many individuals as an overriding goal. He doesn’t wish any single person harm, but the mass of people must be thinned out. And (in his view) many will die anyway in the coming dieback of humanity. By artificially forcing an early dieback, he will give humanity the best chance of future happiness. Crazy stuff, but logical according to *his* logic.

[Where is all this heading? What is the point? Patience, I’ll get to it.]

He will go to infinite effort to spread pneumonic plague world-wide, all timed to a specific date. Growing antibiotic-resistant cultures in his home, converted to an amateur biology laboratory. Mailing freeze-dried bacteria world-wide. At the last minute, spraying bacteria-loaded media into the air at a major international airport. ... And it will all fail, miserably, in the worst possible way. Tens of thousands, even hundreds of thousands will die. Of no significance for his goal. And experts will suspect that this was no natural spread of disease.

So far so good (or bad), but what now? Well, he will discover this incredible book in the library. Some title like “Destroy the World: A Practical Guide.” I will make the

book seem better than it could possibly be by giving only glimpses into it, hints about its contents. The book will forcefully and contemptuously predict the failure of his approach. So much for that. Then it will go on to talk about other, better ways. There will be amazing chapters like: “Attack the Food Supply.” Sample contents: “Ever hear of ‘Red Rust of Wheat’?—easy to obtain from plant biology labs, easy to grow, easy to spread. Wheat isn’t the only source of food? Ever hear of ‘Rice Blight’?” And so it goes. I have an actual book off the Internet called “The Terrorist’s Handbook” and could include tidbits about explosives from this source.

Another chapter title: “Get Them to Kill Themselves.” More practical advice, from starting local conventional wars to global thermonuclear ones.

He will resolve to try again, *really* try this time, and succeed. End of the book, at least in one form.

[Whew! Get to the point, Wagner.]

I’m not likely to write this “book” (vaporbook, non-book) anyway. If I write it, it’s not likely to be any good. Whether good or bad, it’s exceedingly unlikely that it would be published. If published, it’s not likely to be widely read. I concede all that, but it still leaves the main question: Could any harm come from a book like this? How would I feel if this book led to some disaster?

Here’s one scenario leading to harm. There are crazy people out there. When I first started thinking about this “book.” I was like my main character, thinking that a global dieback based on pneumonic plague might actually be workable. It wouldn’t in fact work, for a variety of reasons, even given considerable expertise on the part of the instigator. Over time I thought of and heard of more sophisticated schemes, more subtle ones. My hypothetical crazy out there might resolve to proceed in a more effective way just like my character, as a result of my book. He might actually skip the initial failure described and predicted in my book. Of course these other schemes (“Attack the food supply”) probably wouldn’t work either. The book wouldn’t be a how-to guide by an expert.

It’s hard to explain, but to be successful, my book would do a good job of presenting my character’s point of view. In the best case it might warp the reader around a little. “Maybe it ought to be done,” I would want some readers to think. It might be convincing to my hypothetical crazy reader.

Over the years there have been similar books published, though none quite as directly relevant to an unbalanced person as mine might be. One book (by Frank Herbert) postulated a genius-level molecular biologist whose family is killed somewhere (maybe Northern Ireland) by a bomb. He resolves to get back at the human race and creates a weird virus to that end. Of course no normal (but screwed-up) person reading such a book is going to start thinking about actually doing something similar, since the lead character is presented as a biologist and a genius.

Another book concerned the kidnapping of a physicist by terrorists who had stolen some Plutonium. They want him to use their material to build a bomb. He successfully builds the bomb, and it actually detonates. I asked a friend in publishing specifically about

this book (and indirectly about my own). Would a publisher shy away from a book that might inspire people to do bad things? (I never saw this particular book in paperback, and I thought it might have been censored somehow.) My friend said briefly, “If a publisher thought he could make money off a book like this, he’d go ahead with it.”

Do I dare write such a book? Could I write a book about writing such a book? (Nah, books within books never work.) Could I somehow make the book more acceptable morally? (Whatever this means.)

Let me digress to talk about Nabokov’s novel *Lolita*. As I was reading this book (with considerable enjoyment in Vienna of all places), I thought I understood Nabokov’s intent—he meant to tell an entertaining, funny story, and I felt he was succeeding. (“Frigid gentlewomen of the jury, I ask you—I was not even her first lover.”) In later sections the novel turned darker, and was certainly not funny, not funny at all. So what was he trying to say? I suppose he would have been offended at the thought that he was trying to “say” anything. But he may have said many unintended things. He worked hard to create a sympathetic character who is interested in little girls of a certain type—“nymphettes” the character calls them. These are not twelve-year-olds who look sixteen and could easily work as a prostitute, like the girl in the stupid movie based on his novel. No, Nabokov’s nymphette is a sexy little girl who hasn’t even started puberty. The girl he “associates with” in the novel is a willing sex partner not at all put off by his advances. Now picture the myriad sick men out there who also like little girls, and imagine their reception from a typical little partner. The girl might act willing, but is more likely to be severely emotionally affected by such an episode. Nabokov was not only encouraging such acts against children, but suggesting that the molestations might very well be welcome.

So my novel would have a natural second part, which I hope would not sound like an afterthought. I have visualized my character meeting someone whose child died as a result of his efforts. To keep the story from sounding over-emotional, I would have the parent describe the death in very matter-of-fact terms, without overt grief. The personal and direct experience of a victim is overwhelming for my character. He develops a compulsion to do something about his guilt, his responsibility for this and other deaths. I will have him meet some minister/priest to whom he turns for help. This minister will convince him of the possibility of repentance and forgiveness. Just as in “Crime and Punishment”, he will turn himself in at the end.

One final fear. In the admittedly unlikely event of a publisher, can’t you see the editor saying, “Good story. We can move it, but you’ve got to cut out the dorky ending.” Ah, well.

References.

1. Richard Rhodes, *The Making of the Atom Bomb*, Simon & Schuster, 1986.
2. Stanislaw Ulam, *Adventures of a Mathematician*, Charles Scribner’s Sons, 1977.