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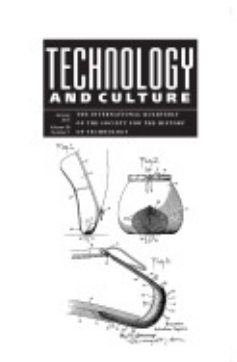
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## Technologist-Historian: Data Visualization Meets the Archive

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## Technologist-Historian

### Data Visualization Meets the Archive

HANNA ROSE SHELL and ALEX WELLERSTEIN

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*NukeMap is an interactive data-visualization website that allows visitors to detonate virtual nuclear bombs on global targets of their choice.<sup>1</sup> It is the creation of Alex Wellerstein, a historian of science and technology who launched the site in early 2012. In NukeMap, the visitor selects a type of nuclear device, defining its size, or chooses from a menu of predefined options that model the effects that an actual historical bomb would have on a present-day target. Interactive-display options allow visitors to explore map layers and datasets such as blast radius, fallout pattern, and number of casualties. Hyperlinks connect to additional historical resources. He or she may, for example, see how much damage “Little Boy,” the bomb dropped on Hiroshima in August 1945, would do if dropped on modern Mumbai, or “Gadget,” the bomb detonated over the New Mexican desert in the Trinity test, would do if dropped on Manhattan today (figs. 1, 2).*

*In the following conversation, we discuss Wellerstein’s production of Nuke-Map in the context of his background as both a historian and digital-media creator. The discussion focuses on how the project connects to both his own and others’ scholarly and pedagogical endeavors.<sup>2</sup>*

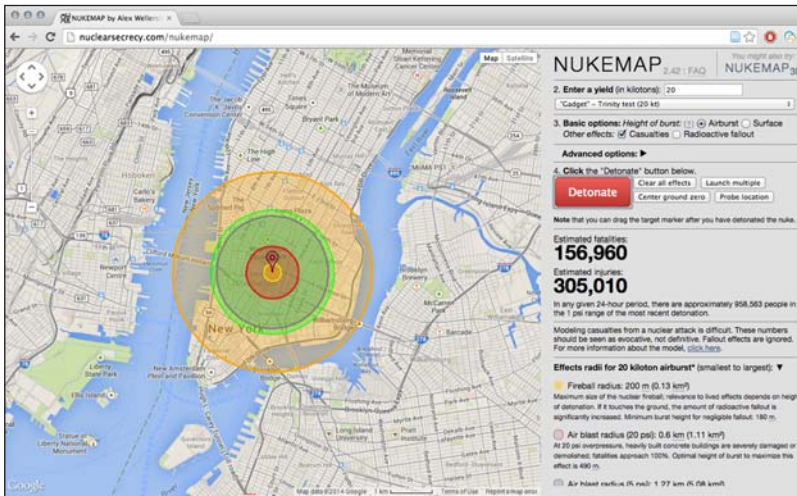
**HRS:** The original NukeMap (shown in fig. 1) is two-dimensional. What motivated you, more recently, to make a 3-D version?

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1. The original NukeMap is available online at <http://www.nuclearsecrecy.com/nukemap/>. The 3-D version, which requires Google Earth, is accessible at <http://nuclearsecrecy.com/nukemap3d/>.

2. Further background on the project itself, as well as the historical foundation and digital media processes on which it is based, are available through the archives on Alex Wellerstein’s blog, “Restricted Data” (<http://blog.nuclearsecrecy.com/>). Additional pedagogical resources can be found at: <http://blog.nuclearsecrecy.com/resources/>.

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**FIG. 1** NukeMap detonation of “Gadget,” the twenty-kiloton bomb used in the Trinity test, over Manhattan. The visitor has selected what information she/he would like to model; in this instance, fatalities, injuries, and effects radii are indicated. Hyperlinks lead to information about the model itself, historical background, and access to NukeMap 3-D, which runs on Google Earth, as opposed to this version, which operates via Google Maps. (Source: Screen shot from <http://www.nuclearsecrecy.com/nukemap/>, courtesy of Alex Wellerstein.)

**AW:** In early 2013, I was asked if I could figure out from a photo of Hiroshima how tall the cloud was at a given moment. And I found I didn’t have any sense for what a thirty-thousand-foot cloud was. And so I modeled in Google Earth just a very simple cylinder that went up to twenty-thousand feet or so. Just nothing fancy. I just imported a cylinder and I was struck by, my God, twenty-thousand feet is high, right? That’s a big, big cloud for what we think of as a small bomb. That was the beginning.

**HRS:** Do you think of it as a historical project?

**AW:** Definitely. I’d say that it’s very much a product of a historical mindset, even though in the end, it’s not an explicitly historical output. But since we’re talking about science that was developed in this really specific historical context [WWII and cold war nuclear physics]—and that’s where all the technical literature that you can find today comes from, and it’s necessary both to understand the science, and to be able to navigate through and interpret the historical materials—it is very much a synthesis of those things.

For example, picking a good model for displaying radioactive fallout was nontrivial. When I finally found one that looked like it would be adaptable to the code requirements, the copy of the report I had was

JANUARY

2015

VOL. 56



**FIG. 2** Photographic documentation of the Trinity test, the detonation of the “Gadget” by the U.S. Army in New Mexico on 16 July 1945. (Source: LA-UR-06-1068, courtesy of the Los Alamos National Library, Los Alamos, New Mexico.)

so bad you couldn't read the equations. And so I had to go down to the National Library of Medicine and actually get an original copy of the report—it was the only place in the country that even had one—and make my own photocopies of it and really work with it, which is really . . . that's what a historian does, right?

**HRS:** Can you say more about working with the historical materials?

**AW:** Here's an example: I'm reading this document and it's saying things like, "Well, we're assuming you don't have a computer" (because this would take fifty hours to run on a computer in the 1960s). And the author is writing something along the lines of, "So, instead of giving you an algorithm, which we could, we're just going to tell you to draw this like a curve so it makes sense." Well, the funny thing is that, today, you can't just tell a computer to "draw this like a curve so it makes sense." You have to create an algorithm to find every point on the curve. In fact, the hardest part about developing the appropriate algorithms for NukeMap was taking something that was initially developed using computers, but then developed for somebody without a computer, and then putting it into a computer context that is eight orders of magnitude more powerful than what they had, which is to say, your web browser, right, which is a million times better than the computers they had back then. It's both ironic and like doing a full technological loop.

BEYOND  
WORDS

**HRS:** There must be a lot of aesthetic issues that come up in making something like NukeMap. In doing this kind of work, do you consider yourself an artist?

**AW:** I think of myself as more of a designer than an artist. There are things I *want* you to think. I think of design as being very much about the intentionality of the creator. Now, you don't have to be locked into my design. Sometimes, there is ambiguity and sometimes there are multiple meanings and different ways to interpret it. But I try to imbue what I make with a deep intentionality, and often I'm really explicit about it. I don't just do it for the *just* focusing on aesthetics, and I think that aesthetics, especially when you're talking about weapons and secrecy and events in which people actually got hurt—I think that can be problematic.

You do fall down on the job a little bit if you are not actually giving people context, if they're just interpreting terrible things for their aesthetics. The prettiness of, say, a nuclear detonation photograph is the easy reading; I want the next step, which is to think about the historical context and to talk about nuclear explosions in a technical way and to say, "No, no, here's what they were trying to do with this bomb. Here's what they did. And by the way, this bomb contaminated five hundred people downwind of it and gave some of them cancer."

**HRS:** So does that mean you are opposed to aesthetics?

**AW:** You can use the aesthetics. I'm not against aesthetics. The mushroom cloud is aesthetically striking and ties into a whole set of preexisting cultural and psychological associations. My problem with how people usually regard the mushroom cloud is they're only used to seeing it in

JANUARY  
2015  
VOL. 56

test footage. And you get no sense of scale from that, usually. You can't tell how far away the cloud is; you can't tell how big it is. You can tell it's big, but the difference between a twenty-thousand-foot cloud and a hundred-thousand-foot cloud is quite profound.

With NukeMap 3-D what I wanted to do was to take that familiar motif and move it into a context where people could modify the view repeatedly, so they could go in close, or they could go out from a distance. They could see it from a perspective they were used to, like, say, an airplane, or the ground, or even one that they weren't used to, such as low Earth orbit, at the height of the international space station.

I wanted people to be able to, in a way that you really can't do with print media, or anything that's noninteractive, I wanted them to be able to interact with the mushroom cloud. And to me, that was the whole point of it, because once you can interact with the mushroom cloud, it becomes something more than just aesthetic—it becomes more tangible.

**HRS:** NukeMap has received lots of publicity in popular news outlets. How has the academic world responded to it?

**AW:** Among academics, those who like it the most and give me the most feedback and most enthusiasm are people who work in policy, but are also interested in history. So people who teach classes on nuclear weapons that are meant to be both historical and present-day—these people love it. They will tell me things like “Oh, my God, the class perked up that day for the first time.” It seems to have a strong effect on students. I've had colleagues say, “This is the one thing they kept writing on their response sheets that really got them thinking or got them working.” As for me personally, I've always gotten a good effect on students when I use it in classes or public lectures. I measure the effect by the sound of the gasp that the students give when, in NukeMap, I tack between a Hiroshima-sized explosion and the first hydrogen bomb.

**HRS:** How do you describe what you do? Are you a computer programmer, or a historian, or both?

**AW:** I'm a historian, but I've been doing computer programming for a long time. It's just one of these skills that I happen to have and I've been developing simultaneously with my historical study and interest. And over time, as with any kind of skill that's amenable, database and digital-media work merged into the practice of the historical work very tightly. I'd say NukeMap is a product of me as a computer person and also as a historian. In the end, I'm a historian of science and technology who makes things.