

# The Half- Life of Story

*Peter Galison*

On the eve of all-out war, scientists in Nazi Germany (most famously Werner Heisenberg) alerted the German weapons authorities that a uranium-based fission bomb might be made. On the other side of the Atlantic, Albert Einstein wrote President Roosevelt that the Germans might well try to build such a decisive weapon and that America should be alert. By 1942, the Manhattan Project was underway in the United States; within months a new industry began to arise, two billions of dollars lifting it from test tube and table top to a factory complex stretching from coast to coast.

The dawn of the Cold War in 1947 produced a myriad of new studies about the future of warfare—but it was the Korean conflict of 1950 to 1953 that launched a vast, never-to-be demobilised armed force. In this state of permanent alert, planning continued unbroken. Commander of the US Air Force, Henry H. (Hap) Arnold launched 'Project Rand' as a way of forecasting the character of future intercontinental war. The project became a part of Douglas Aircraft and, soon after, a hugely influential non-profit think-tank. One of the Rand's first reports was 'Preliminary Design of an Experimental World-Circling Spaceship.'<sup>1</sup> Though its title sounds like science fiction, over the next ten years the preliminary design morphed into a major Air Force effort to develop reconnaissance satellites.

Planning documents took many forms—from qualitative proposals to mathematical economic forecasts. But among this new literature of future war there figured a novel form of imagination, a

new, fragmented form of story-telling that came to be known as the *scenario*. Located somewhere between a story outline and ever-more sophisticated role-playing, war games scenarios multiplied. Developed and popularised by the defence intellectual Herman Kahn (a model for Stanley Kubrick's Dr. Strangelove), the scenario emerged from war gaming to become a staple of the new futurism. Both celebrated and reviled for his view that nuclear war was 'survivable', Kahn insisted to politicians, civil defence, and military leaders that they must think through what might actually happen after thermonuclear war—even if millions lay dead.<sup>2</sup> In his 1962 book, *Thinking the Unthinkable*, Kahn outlined what he meant by this novel (or at least newly-deployed) concept: 'A scenario results from an attempt to describe in more or less detail some hypothetical sequence of events.' It could emphasise some 'future history' process of armed escalation, of the spread of war or its contraction. Scenarios could investigate in short narrative form a limited war or, for that matter, the termination of a nuclear exchange. 'The scenario is particularly suited to dealing with several aspects of a problem more or less simultaneously [helping us] get a feel for events and the branching points dependent upon critical choices.'<sup>3</sup>

The reason scenarios were required in this most destructive of imagined futures was that we, in fact, had little to go on from lived history. Kahn insisted, 'Thermonuclear wars are not only unpleasant events, they are, fortunately, unexperienced events, and the crises which threaten such wars are almost

equally unexperienced.' As Kahn saw them, scenarios carried five advantages over other forms of prognostication.<sup>4</sup> Scenarios dramatised particular elements of reality, forced planners to confront key details, and captured simultaneously bits of psychology, sociology, and political and military texture which mathematical models could not. More than that, scenarios zeroed in on specific choices—playing out alternative endings to real crises like Lebanon, Suez, or Berlin.

Kahn conjured, for example, a scenario that could lead the Soviets to launch a pre-emptive thermonuclear attack on the United States, based on a 'calculated win.' But Kahn also says that there are imponderables—difficulties that might arise as the Kremlin moved toward the decisive flick of the switch. Here is Kahn imagining Premier Nikita Krushchev in contentious imaginary dialogue with one of his generals, including the long-and-ever-contested Ukrainians. In this fantastical exchange, Krushchev says: "I will pick up the phone and say 'Fire!' The officer will reply, 'What did you say?' I will repeat, 'Fire!' He will say, 'There seems to be a bad connection. I keep hearing the word 'Fire.'" I will say, 'if you don't fire I will have you boiled in oil'. He will say, 'I *heard you* that time. Don't fire! Thank you very much!'"<sup>5</sup>

Here we have three features of the nuclear scenario: first, an apocalyptic imaginary surrounding the whole, giving the mini-narrative a frisson of terror; second, a pseudo-specificity of reference—here a colloquial dialogue; and third, a caricatural

sketch of reality, an extension of some element of the world into its asymptotic extreme. Such scenarios extended easily into a kind of (military) improvisational theatre. An example: 'The incident is the explosion of a nuclear weapon at a S[trategic] A[ir] C[ommand] base near Mobile, Alabama, killing 50,000 people. In addition to estimates of destruction and casualties, the President receives the following information: the location of the explosion is consistent with accident or sabotage; there was only a slight likelihood that the explosion was an enemy bomb'. Officers and politicians began imagining how they would respond. Once again—apocalypse, specificity, caricature.<sup>6</sup>

Rewriting history into scenarios became another way to 'practice' dealing with the endless crisis of the Cold War. Kahn provided his readers with ten such scenarios ranging from ancient to contemporary times—even Biblical and fictional episodes could be transmuted into scenarios. King Arthur's Camlann, Pearl Harbor, the Reichstag Fire—the list goes on, each reduced to a logline or two. From the Berlin Blockade back to Biblical Armageddon, this heady mix was suddenly even more relevant after the Cuban missile crisis of October 1962<sup>7</sup>—in turn powering even more Kahn scenarios: unintentional, tactical, mutually provocative 'what ifs' that spiraled from an East German event to a Cuban standoff.<sup>8</sup> Kahn's scenario building between fact and fiction caught on—and was used by some of the largest corporations in the world. Pierre Wack, at Royal Dutch Shell, was well aware of Kahn's cataclysmic scenarios, and began adapting scenario thinking

to the oil production and consumption in the late 1960s and early 1970s. Shell futurists began writing storylines warning that oil oversupply might well switch into undersupply—putting the Arabian Gulf into position of unprecedented power as they bolstered their hand by limiting production.<sup>9</sup>

Over the years, Shell expanded its cadre of future writers and came, more and more, to integrate their scenarists' creations into managerial decision-making. In 2014, for example, anyone could click through the Shell site to see a film illustrating two alternative scenarios about the future of energy, both running to 2050. Number one is called 'Scramble' (the bad, reactive future) and the other 'Blueprints' (the good, prudential future). In the cautionary Scramble, people eventually insist on energy efficiency, and the government 'finally take[s] steps', leading to 'knee jerk' legislation with poorly thought-out policy. Construction companies are unable to adapt quickly enough to the newly-imposed regulations, and only a paltry 15% cut in energy can be effected. Under 'Blueprints', the way forward is deliberate and systematic, with 60% of energy produced by renewables.<sup>10</sup> By the late 1960s, futurists wove themselves deep into the industrial forecasting world, under contract not just to Shell Oil, but to many of the world's biggest corporations, to the National Aeronautics and Space Administration, and to nuclear war planners.

Lurking within the nuclear world was another kind of problem—what to do with the vast quantities of nuclear weapons and power-generated waste that

had been accumulated since early in World War II? Some of it—like plutonium (half-life of 24,100 years)—lasted longer, far longer, than the entire history of human civilisation. By 1957, endorsed by the National Academy of Sciences, a scientific, if not a political consensus was growing that all this weapons waste—not to speak of civilian nuclear power waste—should be buried in a deep, mined repository, preferably in salt that would creep around the interred material, and encase it for the very long term. After decades of political wrangling and backroom deals, the Department of Energy (DOE) chose a site in southeast New Mexico, about 26 miles from Carlsbad. But before the waste site could open, Congress demanded, and the Environmental Protection Agency (EPA) specified, that the DOE had to have a plan that would keep humans from inadvertently stumbling into the waste. Not surprisingly, the period of warning had to be commensurate with the threat; the way the EPA handled most any dangerous material. But unlike many chemicals that broke down over time, the threat from plutonium and other transuranic waste was to be measured in astonishing times. The EPA settled on the period of 10,000 years, long enough to get a jump on the problem during which the geology should remain fairly stable, short enough (so to speak) to be commensurate with recorded human history.

So if you want to talk to the very far future, the 10,000-year future, who would you call? The Department of Energy, through its Sandia nuclear weapons laboratory, located on the Kirtland Air

Force Base near Albuquerque, New Mexico, pulled in futurists like Theodore J. Gordon. Gordon had sketched far-future, inter-planetary projects for NASA (and been chief engineer on the upper stage of the Saturn V), had worked for the Rand Corporation on future studies, and used his own company, The Futures Group, to consult for a wide range of corporations.

Gordon and his 'Boston Group'—including the Yale sociologist and futurist Wendell Bell—began writing scenarios of the future in which people, hundreds of generations in the future, would penetrate the site. If they could anticipate the modes of penetration, then perhaps the warning monument people could block that scenario from coming to pass. The monument makers saw their task as having four imperatives: the monument would have to survive, it would have to be understood, it would need to be recognised as a warning, and the warning would have to be heeded. The scenarists concentrated many of their imaginings on scenarios where the monument would survive and was even understood—but was not believed.

Bell, the sociologist, and chief author of many of the key scenarios, had been a Navy pilot at the tail end of the Second World War, stationed in the Pacific. Horrified by the brutality of occupation that he witnessed, he turned after graduate school to consulting with emerging post-colonial states in the Caribbean and elsewhere as they began to plan their futures. At Yale during the 1960s, he played an active role in the establishment of an Afro-American programme of study, and in opening the university

to women. Bell and Gordon's sympathy for social liberalisation did not extend to epistemic challenges to science. They and the other members of their group saw movements—in their 1989 present—who, they believed, rejected the authority of science.

Here is how the Waste Isolation Pilot Plant (WIPP) scenarists outlined their task: 'What social conditions and individual or group motivation might result in penetration into the WIPP repository...? Let all things be considered so that the marker teams can comprehensively devise ways of marking... Thinking the unthinkable is part of our task'. The scenarios went back to Kahn. Even their phrase, 'thinking the unthinkable' echoed back to nuclear war fighting scenarios—it was, as we have seen, the title of one of Kahn's most discussed books, the very one in which he first popularised the idea of scenario writing. And again like Kahn, the authors stressed that their musings were extrapolated from currently observable trends and tendencies. 'The scenarios, however, may be less unthinkable than they first appear. Each is based on developments for which precursors already exist, from feminist theory and post-/and anti-positivist beliefs to rudimentary artificial intelligence, computer 'viruses' and space travel. The references given are genuine and point to such precursors'.<sup>11</sup>

The Boston Group's 'point scenarios' were not the only ones, nor were such stories the only form of prognostication—there were also quantitative simulations. But taken together, the Boston team's ten stories (set in the Southwest from AD 2091 to the thirteenth millennium), form a kind of

overarching sketch of the kind of anxieties troubling the state-sponsored futurists as they surveyed the cultural landscape. Each built on current trends and rocketed them out to a wild asymptotic limit. Every one (or rather all but one) ended with the catastrophic release of radiation. And each bore a kind of narrative particularity: 'these scenarios are quite detailed. As such they contain specific, imagined events or people. This does not necessarily limit the usefulness of these scenarios. The specificity is useful to give a sense of credibility to the setting'.<sup>12</sup>

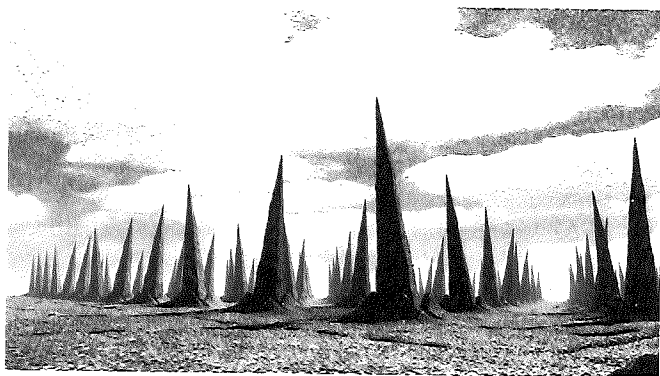
The writers labelled their first scenario, astonishingly enough the very first listed threat, 'A Feminist World, 2091'. 'Men and their violent acts had nearly destroyed human civilization'. Women deliberately chose to have more girl children than boys, and the values associated with masculinist thinking, ranging from 'abstract and analytic thinking' through 'quantification, objectivity, universality, domination, repression and technical manipulation' fell into disrepute. Citing work by Roslyn Bologh's 1990 *Love or Greatness: Max Weber and Masculine Thinking, a Feminist Inquiry*; Sandra Harding's 1986 *The Science Question in Feminism*, and Linda Nicholson's 1989 *Feminism/Postmodernism*, the Boston Group imagined, feared and prophesied that a preference for 'emancipatory theorizing, eros nature, particularity, the development of self-consciousness, interpretationism, and ethical decision-making' might trump the older forms of instrumental thought. In the hundred-year future, so the caricature-scenario concluded, these trends could

be triumphant and a 'Feminist Alternative Potash Corporation' might see the markers, understand the markers, and not believe them. 'They proceeded to mine for the potash that they believe to be there, inadvertently penetrating a disposal room and releasing radionuclides into the accessible environment'.<sup>13</sup>

If feminist epistemologists were the first threat, a second hundred-year danger issued from historians and philosophers of science (joined by other academics) run amok. A cult group, known as the Markuhnians (Herbert Marcuse's 1964 *One-Dimensional Man* morphed with Thomas S. Kuhn's 1962 *Structure of Scientific Revolutions*) had lost faith in the claims of 'positivist science'. Bolstered by founding texts of Paul Feyerabend (*Against Method: Outline of an Anarchistic Theory of Knowledge*), Imre Lakatos 1968 (*The Problem of Inductive Logic*), and others, the religious movement held fast to the idea that the depiction of reality simply depended 'on one's perspective, interests, social position, and prior beliefs and values'. Subjectivists and relativists to the core, the Markuhnians 'deified their early views of intuition and insight' as ways of knowing the world, and blamed established science for the disastrous consequences of nuclear weapons, irresponsible radiological disposal, nuclear power, and other wasteful, dangerous excesses of big science, including the Superconducting Supercollider. Believing that revelatory scrolls were buried in the area, a cult leader, modeled on James Jones who had drawn his followers into mass suicide, led a digging expedition that ended, tragically, when

a geyser of radioactive salt water burst from the old waste site.<sup>14</sup>

So the scenarios went—apocalypse, specificity, caricature. There was 'Buried Treasure', in which Mexican fortune hunters thought the markers



indicated the presence of valuables. There was 'Virus Impairs Computerized People', where robots acted beyond their programmed authority. There was a Japanese auto plant in Roswell, New Mexico. In these waking nightmares, come together the threats felt in that last year of the Cold War—immigration, feminists, science wars, foreign economies, out-of-control technology. There was one and only one salvational story—Bell wanted it included even if their instructions were to look only at modes of failure. In it, the one and only Hollywood ending, the government had wisely established an amusement park above the

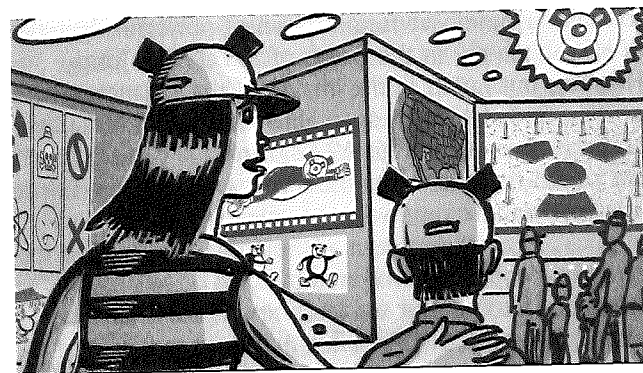


Image left: Spike Fields, frame from Maya 3D motion animation, David Lobser; image above: 2D graphic image, Peter Kuper; both from Galison and Moss, *Containment* (2015) and *Landscapes of Stopped Time*, (2015)

waste site so that memory, passed from generation to generation, could remain strong even as rock crumbled into dust. A deliberately created mythic character, Nickey Nuke (modeled on a combination of Mickey Mouse, Smokey the Bear and Adam and Eve) would forever and successfully warn each generation of children: Do not dig here. Never forget the danger below.

In an interview, Ted Gordon remarked that the scenario was a term borrowed from the movies, a sketch of a storyline. Though its etymology takes us back to the fifteenth century, the modern connotation is very much mid-twentieth. There is something cataclysmic about scenarios as they have come to signify. Something in their near-past re-origination in nuclear cataclysm makes them evacuated stories, specific in certain passing ways and yet hollowed-out. Perhaps it is why, in Japan,

so many people have found the most powerful depiction of Hiroshima not in the words of writers like John Hershey, but rather in the images of the Japanese graphic novelist and child-witness to Hiroshima, Keiji Nakazawa. Nakazawa's images in his 1972 comic *I Saw It*, are anything but photo-realistic.<sup>15</sup> The modern scenario of the future was born and in some sense remained in the shadow of nuclear cataclysm, even as the scenario extended to economic upheavals imagined by Shell or to possible intrusions into nuclear waste dumps in the millennial future. Here was State science fiction.

My work with Robb Moss, in our film 'Containment' (2015) and the installation 'Landscapes of Stopped Time' (2015), confronts the disruption to time precipitated by nuclear materials. Suddenly, even the 300-year ancestral home of a Namie family in the Fukushima Prefecture shatters against the even slower half-life decay of radioisotopes. These out-of-scale times haunt both technical experts and ordinary citizens who live near contaminated zones—as she walks through her abandoned town, one young woman from near Fukushima says in the installation and film, "This is what it is like for time to stop."

But perhaps the greatest challenge that Robb Moss and I faced in making the film was how to register this strange, contemporary form of scenario narration. For planned monuments, we could, with our 3D animator David Lobser, extend the actual designs that planners had developed for the future burial site. But scenarios resist traditional, continuous-motion animation, and even more so live-action depiction. In the fragmented, lightning-flash reality of the scenario, full texture is withheld, glimpses

are all we get—a fully realised representation in space or time would utterly distort the whole idea of this conditional future.

So how to do this in film? After much experimentation, here it seemed far better to find an art form that itself withheld as much as it disclosed—the graphic novel sequence. Collaborating with the cartoonist Peter Kuper, whose *Metamorphosis* (2004) seemed to capture the right tone, we began a long back and forth that culminated in the 2D frames that pieced together the scenarios of nuclear intrusion from 1989.

Our aim in the film is to cross three kinds of filming, each of which confronts the measures of time given by long half-lives: observational (of work and life around three sites where radioactive isotopes loom large); analytic (around interviews with key people); and the imaginative future (depicted through these different kinds of animation). Our work is about—and incorporates—our strained governance of space and time in a world of near-endless half-lives.

I should add one last thing. The Waste Isolation Pilot Plant in Carlsbad, New Mexico, was designed to be 'built clean and to stay clean' for ten millennia—until at least 11,991. But perhaps we need another scenario, or maybe a thousand grubby little ones that might never make it to the high drama of the apocalyptic. Late on Valentine's Day, 2014, an underground accident propelled transuranic dust out of the salt mine, leaving some workers with a small but measurable radioactive dose. Sometimes it is hard to imagine our world in the here and now, far from the dark pleasures of the infinite future and infinitely exaggerated.



But we must.

NOTES

- <sup>1</sup> F.H. Clauser, 'Preliminary Design of An Experimental, World-Circling Spaceship'. Rand Corporation Report, May 2, 1946.
  - <sup>2</sup> Herman Kahn and Irwin Mann, 'War Gaming', Rand Corporation Report, P-1167, July 30, 1957; Herman Kahn, *On Thermonuclear War* (Princeton: Princeton University Press, 1960); see the remarkable study of Kahn, Sharon Ghamari-Tabrizi, *The Worlds of Herman Kahn: the Intuitive Science of Thermonuclear War* (Cambridge: Harvard University Press, 2005).
  - <sup>3</sup> Kahn, *Thinking about the Unthinkable* (Princeton: Princeton University Press, 1962), p 143. On earlier forecasting—from economics, see Walter A. Friedman, *Fortune Tellers: The Story of America's First Economic Forecasters* (Princeton: Princeton University Press, 2014).
  - <sup>4</sup> Kahn, *Thinking about the Unthinkable*, quotation from p 143; five features, p. 144.
  - <sup>5</sup> Kahn, *Thinking about the Unthinkable*, p. 152.
  - <sup>6</sup> Kahn, *Thinking about the Unthinkable*, p. 159.
  - <sup>7</sup> Kahn, *Thinking about the Unthinkable*, pp. 172-73.
  - <sup>8</sup> Herman Kahn, *On Escalation: Metaphors and Scenarios* (New Brunswick, NJ: Transaction Press, 2010 [original publication Praeger, 1965]), e.g. pp. 34ff.
  - <sup>9</sup> Pierre Wack, 'Scenarios: Uncharted Waters Ahead', *Harvard Business Review*. September-October, 1985; followed by 'Scenarios: Shooting the Rapids', *Harvard Business Review*. November-December, 1985. On business scenarios, see also, Kees van der Heijden, *Scenarios. The Art of Strategic Conversation*. 2nd edition. (West Sussex, UK: John Wiley and Sons, 2005).
  - <sup>10</sup> <http://www.shell.com/global/future-energy/scenarios/2050/acc-version-flash/2050.html>
  - <sup>11</sup> Stephen C. Hora, Detlof von Winterfeldt, Kathleen M. Trauth, 'Expert Judgment on Inadvertent Human Intrusion into the Waste Isolation Pilot Plant', Sandia Report SAND-90-3063, 1991, C-38.
  - <sup>12</sup> SAND-90, pp. C-38, 39.
  - <sup>13</sup> SAND-90, pp. C-39, 40.
  - <sup>14</sup> SAND-90, pp. C-42-44, quotations on pp. C-43, C-44.
  - <sup>15</sup> On Keiji Nakazawa, see the remarkable book by Hillary Chute, *Disaster Drawn: Visual Witness, Comics, and the Documentary Form* (Cambridge: Harvard University Press, 2015).
- NB: Portions of this text are drawn from Peter Galison, 'The Future of Scenarios: State Science Fiction', in Bolette Blaagaard and Iris van der Tuin, eds., *The Subject of Rosi Braidotti: Politics and Concepts* (Bloomsbury, 2014), ch. 3.

# Four Fold

A script  
towards a performance

Sam Keogh