

Camera Atomica

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Posing by the Cloud: US Nuclear Test Site Photography in Process

Julia Bryan-Wilson

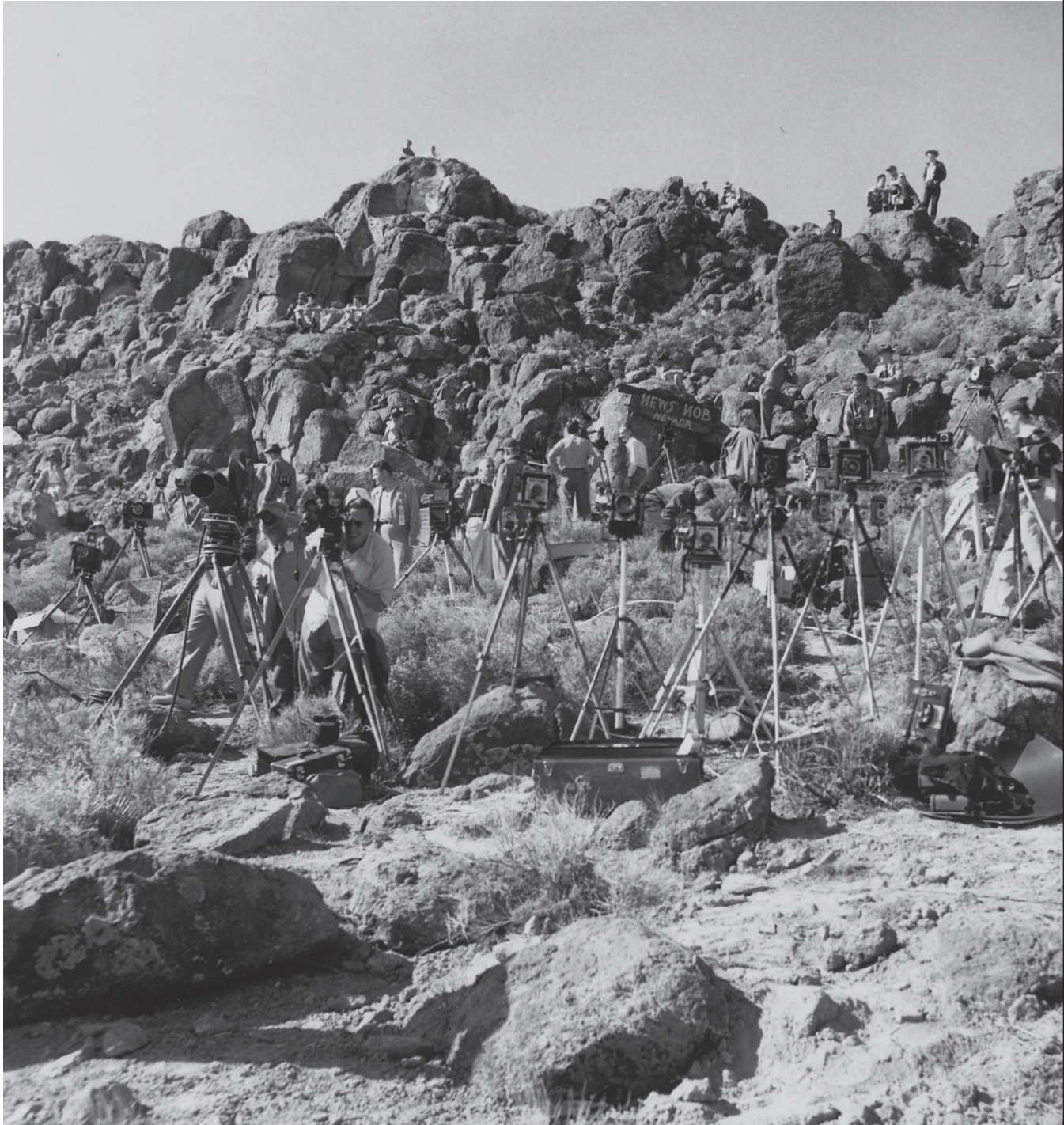


Fig. 1. United States Department of Energy
News Mob, Nevada Test Site, established April 22, 1952, 1952



A cluster of cameras perched on their tripods stare out from a rocky outcropping. [Fig. 1] Boxes of equipment huddle at their feet as men ready the equipment for use. What event have they gathered to capture? What sight are they eagerly facing? This is News Nob, a strategic spot positioned seven miles from the Nevada Test Site that was established in 1952 as a designated area for journalists to photograph the nearby atomic detonations. Between 1945, when the first bomb exploded in Alamogordo, New Mexico, and November 1962, more than 200 known above-ground or “atmospheric” tests were conducted by the United States military, not only in Nevada but at the Pacific Proving Ground in the Marshall Islands and other locations.¹ These tests were diligently, meticulously, even obsessively chronicled both by still cameras and movie reels, producing a vast number of images shot by amateurs and professionals alike, using every type of camera and film, and taken with devices that were stationed on specially constructed towers, slung around the necks of reporters, carried by planes overhead, or amassed at News Nob.²

Screen-based recording technologies and nuclear detonation were conjoined from the very birth of the atomic age: more than 50 cameras were in place and at the ready on 16 July 1945 to witness the Trinity Blast at Alamogordo, including specialised tools that had been invented by the Photographic and Optics Division at Los Alamos for the sole purpose of documenting this brand-new technology, one whose destructive powers—and visual effects—were not yet known.³ Indeed, we have grown accustomed to the images of such blasts, including the iconic mushroom cloud, stroboscopic pictures that dissect the precise unfolding of the explosion, and aerial photographs of the cratered, devastated aftermath—this repertoire of images, which has become highly charged with symbolic and metaphoric power, has been seared into the history of the twentieth century.⁴ This essay sifts through that wealth of material to hone in on a narrow archive, a subgenre within the genre of nuclear test photography: images of atomic tests in which *the camera itself also appears*. [Fig. 2] In a somewhat typical shot within this limited category of self-referential nuclear test photographs, a row of men stand at the ready with their equipment aimed towards the white light in the distance, a white so bright it can barely be registered by the photographic film.

In another photograph taken of the Nevada Test Site from 1957, we can see men—and they are always men—silhouetted against the rising plume, peering through viewfinders and standing behind movie cameras, making sure their aim is perfect. [Fig. 3] Though multiple documentary apparatuses, and the men who operate them, are placed within this frame, they are not in the end its main attraction; the dark grey mushroom cloud in the background, itself a study in tonal contrast with its right side dramatically lit, steals the show. The inclusion of both the blast and the documenters has the effect of naturalising both

the presence and the proximity of cameras—and cameramen—in the above-ground tests. Of course nuclear tests were recorded, such a photograph seems to say; of course there were devices there to do that recording; and of course there were bodies to click the shutters and reload the film. The presence of photographic devices produces an extra layer of mediation into the



Fig. 2. US Military
Operation Teapot, Nevada Test Site,
29 March 1955



Fig. 3. US Military
Operation Priscilla, taken at the
moment of the shockwave, 1957
/ Camera Crew at Exact Moment
of Shockwave Arrival, Nevada
Test Site, 1957

image; it becomes a picture about the taking of the picture. It also raises questions about the uncannily close relationship between the nuclear age and photography, especially when, as in this image from 1957, the effect of the blast has had a noticeable impact on the picture taken—here, the shockwave caused the camera to move, slightly blurring the image.



Fig. 4. U.S. Military
 Lookout Mountain cameraman,
 telephoto lens and Mitchell
 camera: *Operation Teapot*, 1955

There are many such images of nuclear tests that include cameras. Many have been collected in a book by special effects filmmaker Peter Kuran of declassified records entitled *How to Photograph an Atomic Bomb*, published in 2006. He details the development of Lookout Mountain Studios, also known as Lookout Mountain Laboratory, a highly classified Hollywood-based production facility that was subcontracted by the Department of Defense in 1947 to document nuclear tests using both still and motion pictures, outsourcing the role of recording so that the scientists at Los Alamos could focus their attention on weapons development. Though Kuran's is an impressive achievement, complete with technical specifications about film stock used and f-stop recommendations, *How to Photograph an Atomic Bomb* does not comment upon or theorise the repeated appearance of the photographic device within some of these pictures, nor does it mention or problematise the evident sustained interest these photographers had in taking pictures of themselves and their fellow high-security clearance co-workers. [Fig. 4] Notably, they frequently took pictures of one another busy on the scene; these provide more detail and texture regarding what nuclear test site labouring conditions looked like. Only occasionally did these workers wear protective gear that might shield them from the



Fig. 5. U.S. Military
Lookout Mountain Cameraman
Staff Sergeant John Kelly, Nevada
Test Site, 1958

damaging health effects of the radioactivity they were absorbing, as is indicated in this unusual image of Staff Sergeant John Kelly wearing a full-body suit in 1958 at the Nevada Test Site. [Fig. 5.] Unlike the reporters at News Nob, which was about seven miles from the blast, those working for Lookout Mountain had a greater range of access to the tests, and were able to get much closer to ground zero.

More than 250 people, including directors and producers, worked at Lookout Mountain during its existence; about 40 were cameramen sent on location to stand in the face of these blasts. Only a small handful of them appear in the images they took of the explosions, often with their backs to the lens. [Fig. 6] These images signal some of the basic functions proposed by photography since the nineteenth century—that it is an ostensibly objective record of a transient event, and that it is uniquely efficient at registering details difficult for the human eye to grasp “all at once”, say, an impressively carved monument. The Lookout Mountain photographers are intent on capturing as much visual data as possible given the scene as it unfolds. But the Lookout Mountain photographers were also keen to insert bodies into the picture, even when those bodies seem excessive or superfluous to the task at hand; partly, perhaps, they are meant to indicate



Fig. 6. U.S. Military
Operation Dog, taken from
News Nob, 1951

scale, as was common with early pioneers in the history of photography, like Maxime Du Camp in his voyage to Egypt.⁵ It seems logical to claim that military photographers inserted human figures to emphasise the massive size of the mushroom cloud.

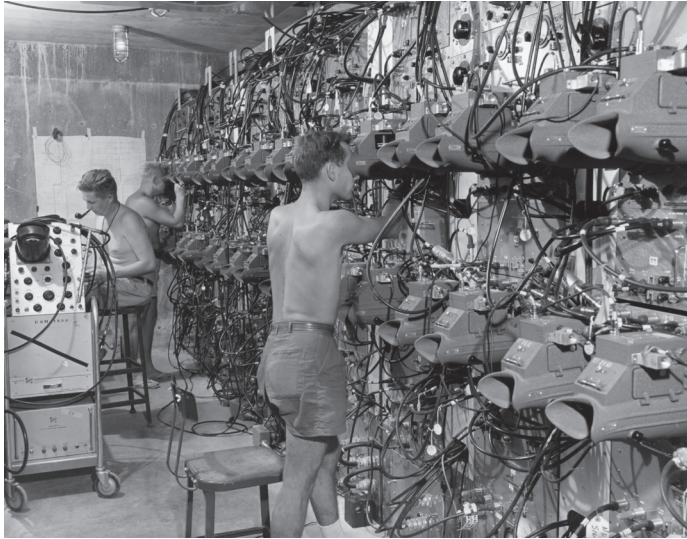
Yet the insistent presence of cameras within many of the images created by Lookout Mountain—and in some, a deliberate distortion of scale—also indicates a pervasive interest in documenting the documenters, in saying *we were here*. Instead of emphasizing their uniqueness to the nuclear age, it is important to see how these images can be repetitive, and strangely similar, as they signal their affinity with other histories of photography. These images have some relationship to tourist photography, but they even more fundamentally betray some of the anxieties that have shadowed photography since its inception: namely, indexicality, temporality, morbidity and violence.⁶ As Susan Sontag famously opined in her *On Photography*, “There is an aggression implicit in every use of the camera.... However hazy our awareness of this fantasy, it is named without subtlety whenever we talk about ‘loading’ and ‘aiming’ a camera, about ‘shooting’ a film.”⁷

In this image, men in khaki and plaid train their lenses on the fireball of the Teapot Military Effects Test in 1955. [Fig. 7] Taken with the use of a telephoto lens that warps scale by bringing



foreground and background together, it shows the profound investment in capturing the documentary process itself, in showing that *these* bodies were in proximity to *these* blasts, wearing nothing more than street clothes to protect them. One of the truth-claims of photography is that it purports to be an indexical register, a record of something that stands with some physical immediacy in front of the lens.⁸ Here that proximity is rendered almost phantasmagoric, as the dust kicked up from the explosion seems to froth at their feet. “Between photographer and subject, there has to be distance”, writes Sontag, but such images propose a radical collapse of that distance.⁹ Given how radioactivity travels and works, its particles permeate the body to immediately draw subject and object together, bound together in a toxic embrace. Although increasing information about radioactivity and its long-term effects began circulating in the late 1950s and 1960s, these photographers (whether they were journalists or military functionaries) felt pressured not to protect themselves, but to get the shot they came for. As reporter Donald English stated about photographing nuclear tests in Nevada: “It was exciting, it was a mystery, and also for the photographers and press covering it, you better come back with some goods, you better have a picture.”¹⁰

In one shot from a series of photographs (not reproduced



OPPOSITE
Fig. 7. U.S. Military
Operation Teapot, 1955

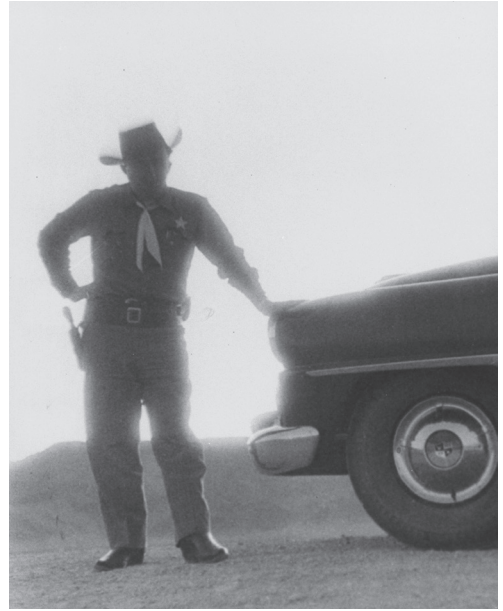
TOP LEFT
Fig. 8. U.S. Military
Bank of Oscillograph Record
Cameras, Operation Castle
Bravo, 11 February 1954

TOP RIGHT
Fig. 9. U.S. Military
Operation Grable, 25 May 1953



here) of a blast in the Marshall Islands, men look out over the calm still waters into the distance, one with his camera pointed towards a large pale puff in the distance. Yet in another image from this series, the men are so awed of the enormous cloud that they have momentarily let their cameras drop—they hang unused by the sides of their bodies. Perhaps they are tourists, rather than military photographers, content to let this instant go by unrecorded. No matter: the military had plenty of other shots: one set of tests alone—Operation Crossroads, from 1946—generated more than one million still images. Along with this wealth of still photographs, the US nuclear test programme and its secret Lookout Mountain corps generated more than 6,500 films, films that were seen by few except government officials until they began to be declassified in 1997 under President Bill Clinton. More were set to be released to the public domain, but the declassification project was halted by President George W. Bush in 2001 in the wake of post-9/11 fears.¹¹

Along with the telephoto lenses used in the example above, virtually every possible seeing device was pressed into service to capture each aspect of these atmospheric tests, and new technologies were invented precisely to do so (including 3-D film, which was first tested at Lookout several months before it moved into the realm of commercial Hollywood).¹² One photo-



TOP LEFT
Fig. 10. U.S. Military
Operation Priscilla [Cameramen Silhouetted at Moment of Detonation, Nevada Test Site], 1957

TOP RIGHT
Fig. 11. George Silk
Nevada sheriff backlit by an atomic blast, Operation Teapot, 1955

BOTTOM
Fig. 12. U.S. Military
Operation Plumbbob/Hood, 5 July 1957

graph shows a bank of 36 oscillograph record cameras placed within the electronic diagnostics station for the Castle Bravo operation in 1954. [Fig. 8] Note the near-eroticism between body and machine, as men with unclothed torsos press into a tangle of cables within a small, enclosed room. Shirtless and pipe-smoking, the men in this image demonstrate a casual familiarity towards highly specialised equipment, and a willingness to believe they are safe from the effects of these tests even when quite literally uncovered.

Part of what astonishes about these images is how unscientific they can be. In one photograph from 1953, a Lookout Mountain camera crew takes images of the test code-named Grable

(a dubious homage to the film actress Betty Grable). [Fig. 9] The cameraman who took this shot has stationed himself at a distance from the three figures in the foreground, deliberately stepped back in order to include them in his frame. Yet by doing so, he has obscured the base of the mushroom cloud, compromised its visibility in his desire to show the process of photographing. In many of these images, the photographer has detached himself slightly from his unit, moved his camera and tripod back a bit in order to highlight the presence of the camera, thereby at risk of failing to capture the blast. Would a scientist not want to press forward rather than fall back, to get the clearest and closest picture, with the maximal amount of information? Or does this pulling away indicate a reasonable shirking from this deadly technology?

In an image taken of the Priscilla test in 1957, the photographers are backlit by the intense obliterating light of the blast. [Fig. 10] The moment of explosion appears like innumerable suns condensed over the horizon, boring a hot white hole right through the sleeve of the photographer. This image belongs to a further subgenre within the restricted realm of nuclear test photography: pictures taken at the exact moment of the atomic blast in which the overwhelming amount of light renders the image difficult to read. These are photographs in which the nuclear glare blows out or eats into the very details that the picture aims to record. Exposure was an extremely tricky matter for nuclear test photographers, especially because the amount of illumination generated by the blast varied so rapidly, such that "film exposed properly at one moment will be overexposed at earlier times and underexposed later".¹³ In fact, former Department of Defense photographer George Yoshitake reported that "the biggest challenge was what kind of exposure do you use".¹⁴ In another related shot from 1955, a Nevada sheriff's face becomes a mask-like featureless blur as he stands proudly, one hand on his hip, the other on his car, as a bomb bleaches out the background some 40 miles away. [Fig. 11] And here, the shake caused by the shockwaves degrades the outlines of the photographers so seriously that the substance of their bodies virtually disappears, dematerialising them into phantoms or specters. [Fig. 12] This ghosting of figures echoes Akira Lippit's notion, in his suggestive book *Atomic Light (Shadow Optics)*, that the "burning" archive of atomic imagery erases the line between visibility and invisibility.¹⁵ In nuclear test photography, the divide between the thing itself and its representation takes on new meaning. Some soldiers who witnessed in person the Priscilla blast, which was billed as "a wonderful sight to behold", bled from every orifice of their faces.¹⁶ To look at a bomb directly is to do harm to oneself, but to look at the photo of the bomb is of a different order as that harm is neutralised.

It is important to note that the atomic tests performed in the 1940s and 1950s in the United States were for the most part



Fig. 13. U.S. Military
Representatives of five European
Nations watch the cloud formed by
an atomic detonation, 24 July 1957

public, performed in plain view of tourists and others eager to witness the spectacle. As historian Allan Winkler has stated, “Most Americans were initially enthusiastic about the tests. Recognizing that public support of the program was necessary to ensure continued congressional funding, the AEC [Atomic Energy Commission] courted the national press. The commentary that emerged played up the spectacular side of the tests and ignored potential dangers.”¹⁷ Though most of the images explored in this essay were taken by a secret corps of trained photographers and meant for military or governmental consumption, news photos of the blasts were published regularly in widely circulating venues like *Life* magazine and, in 1951, live footage was screened for the first time on television.¹⁸

Given the Cold War climate of competition, the lively nuclear test programme was a matter of not insignificant national pride; “open shots” were publicised and dignitaries were invited to witness the proceedings. In one photograph, a bank of nuclear test spectators, representatives from five European nations, sit on benches, as if watching polo at a country club, to watch the mushroom cloud rise. [Fig. 13] They wear no visible form of protection, as their safety goggles hang down unused. What look like security badges—they could also be dosimeters meant to measure radiation—dangle from their jacket pockets. This image is compelling not only for its nonchalance, but also because, like the others, it suggests a different kind of observer, as the person who took this photo has decided to turn away from the explosion instead of towards it. And there might have been a protective function in that act of turning away. A reporter recalls: “[W]e had explicit instructions—we were given heavy dark glasses for eye protection but even with that you couldn’t look at the bomb. You had to turn around a hundred and eighty degrees [from] the area where the bomb was going to be detonated because the intensity was still so great.”¹⁹

The flash of the bomb often acts in place of the flash of the camera in these images, and this substitution demonstrates how, in fact, there is a peculiar affinity between photography and atomic weapons, as the technology of sight and the technology of death are conjoined in an intimate marriage. As observers noted at the time, the tests photographed beautifully; their dramatic shapes were understood as spectacularly conducive to optical capture. Think back to Grable, both the actress who was famous for how the camera loved her face, as well as the atomic test blast, frozen on film: it is as if the mushroom cloud courts or solicits the camera's gaze. Yet as we have seen, the blasts also carry the potential to damage the film that desires to register them, as well as the potential to harm the bodies behind the cameras that are clicking the shutters. In one of the most widely read and cited texts on photography, Roland Barthes' *Camera Lucida*, he says photography and its referent with their shared "funeral immobility" are "glued together, limb to limb, like the condemned man and the corpse in certain tortures".²⁰ In nuclear test photography, preservation and destruction are pressed together with even more intimacy, as the deathly referent *acts upon* the photographer, with a temporal lag that is challenging to account for.

At the time, the hazards of these tests were of scant concern to the military that conducted them; atomic veterans near detonation sites went through only the most cursory decontamination procedures, including having radioactive waste brushed off of them with brooms.²¹ Residents who lived near the test sites (aka "down-winders") were regularly assured that fallout would bypass their towns, and that the plumes of smoke and other debris did not pose significant health concerns.²² Not only that, but the indigenous residents and the ecosystems of these regions were utterly ignored. As Valerie Kuletz writes in her book *The Tainted Desert*, "Native peoples and their lands constitute an invisible presence in areas heavily occupied by the US military and Department of Energy.... [This book] attempts to make visible the close proximity of Indians and military and nuclear regions and to show how a consistent pattern of nuclear colonialism—suggesting environmental racism—might emerge."²³

To witness these images now, some 60 years after the era of atmospheric nuclear testing in the US, is also to bear witness to a kind of injury that in fact *thwarts* photography. So while there might be an affinity between the camera and the blast, at the same time, the photograph, with its immediacy, its grasp of the instant, the way it captures *this thing here now*, is also unsuited to record the unique kinds of destruction wrought by radiation. It cannot depict the slowly blooming invisible damage that accompanies these blasts and shoots itself into our atmosphere and into bodies, damage that can in fact take years, even decades to reveal itself. In a photograph from 1957, five volunteers shield the light of a bomb from their eyes with their hands. [Fig. 14]



They are standing right at ground zero as an air-to-air nuclear missile is detonated 10,000 feet above their head, and they wear no protective goggles or outfits. The man who took this image (and is hence not pictured, but hovers implicitly outside the frame), George Yoshitake, is one of two of these men who is still alive; all of them have had cancer.²⁴

Yoshitake recalls asking what sort of protection he would be given, and when the answer was “none”, he brought a baseball hat; unlike the others, he was not a volunteer. He recounts: “I thought it was just another job to do.”²⁵ It was a job with consequences: the life expectancy for atomic workers is on average 57 years, and they have above average rates of cancer, infertility, heart conditions, chronic respiratory illness, skin carcinomas, hepatitis c and leukaemia.²⁶ Diseases caused by exposure to radiation can have latency periods of 40 years or more, and are not just contained to a single body; children of atomic workers have high rates of cancer, genetic mutations and birth defects.²⁷ This intergenerational unfolding of lingering effects is something that a photograph, which has an insistent present temporality, is not well-equipped to capture. The stuttering time of radiation reveals the insufficiency of photography as a document of causality.

Photographs have been used—often unsuccessfully—to try to prove governmental culpability in the US and elsewhere for illnesses faced by nuclear weapons workers and servicemen. An article published in 2002 in the British *Sunday Mirror* makes the paradox of using photography to verify bodily injury very clear. It focuses on a single photograph of four British officers in the Pacific, while “behind them a giant mushroom cloud balloons in the sky, one of Britain’s biggest A-bomb tests”.²⁸ Three of these men suffered serious health concerns, including cancer and diabetes, yet the British Ministry of Defense refused to acknowledge



TOP LEFT

Fig. 14. U.S. Military
Five Air Force officers are observers at Ground Zero during the explosion of the first air-to-live atomic rocket ever fixed from a manned aircraft, 1957

TOP RIGHT

Fig. 15. Carole Gallagher
Bonnie McDaniels
and Marjorie Lease, June 1986

RIGHT

Fig. 16. U.S. Military
Operation Tumbler-Snapper, 1952



that they had been put in harm's way. One veteran says, "The photograph proves it. But when I asked the MoD for a pension they said I was not in an area affected by radiation. They even said the film badge must have been issued to me as part of a simulation exercise." The photograph was considered inadequate indication of proximity to radiation, and even the presence of dosimeters on their uniforms was not reliable or convincing enough. Because of its truth claims, photography can appear to be transparent, but it is also subject to manipulation and simulation, and can unravel in the face of demands for hard evidence or conclusive scientific proof. Again, to quote Barthes: "the photograph is a certain but fugitive testimony".²⁹ Photography becomes unfixed as evidence for long-term damage because it cannot connect the *then* to the *now* with any firm causality.

At the same time that governments shrewdly and disingenuously deny the weight of photographic "proof", photography has persistently been marshalled by activists and artists to provide affective, moving witness regarding the negligence and disregard faced by nuclear workers and "down-winders".³⁰ In 1993, Carole Gallagher published her book *American Ground Zero*, an important document regarding the devastation caused by the US nuclear weapons industry. One image places a wife and daughter in front of a blown-up photograph of a man, Hap Lease, who worked at the Nevada Test Site for 14 years. [Fig. 15]. The photograph-within-the-photograph is a close-up of Lease, taken when he was about to die of thyroid cancer showing his neck ravaged by large ulcerating tumors. Their caption: "A Gift From Our Government! Cost: A Life and \$198,000". Photos like this have not always been enough to convince the US military that its Cold War operations were irresponsible and careless—and many veterans have received very little monetary compensation for the illnesses brought on their bodies and their families by their duties.

Barthes' grim but wholly apt assessment about "the rather terrible thing which is there in every photograph: the return of the dead" is true in a new way when looking at images of nuclear test photography, as so many of these men died before their time.³¹ Recall his certain words when gazing at a handsome young man named Lewis Payne in his cell as he waited to be hanged: "*he is going to die*". In a photograph of the Tumbler-Snapper test shot at Yucca Flat, Nevada, the handsome young Marine in the middle has turned away from the bomb. [Fig. 16] Our eyes may be drawn to the cloud with all its powers of destruction, but to look at this man, whose face meets ours as he poses and points for a camera, is also to stare at death: SMILE.

NOTES

- 1 Though this essay is focused on the United States, other countries, most prominently the Soviet Union, also conducted atmospheric nuclear tests in this period. Most tests were sent underground after the passing of the Limited Test Ban Treaty in 1963, though France and China, who were not signatories, continued this practice until at least 1980. Histories (both academic and anecdotal) of the United States nuclear weapons testing programme can be found in Jane Dibblin, *Day of Two Suns: US Nuclear Testing and the Pacific Islanders*, New York: New Amsterdam Books, 1990; Richard Miller, *Under the Cloud: The Decades of Nuclear Testing*, New York: Free Press, 1986; A Constandina Titus, *Bombs in the Backyard: Atomic Testing and American Politics*, Reno, Nevada: University of Nevada Press, 1986.
- 2 Donald E English furnishes a first-person account of photographing blasts as a reporter from News Nob in his oral history with Michael Childers, conducted on 25 March 2004 as part of the Nevada Test Site Oral History Project, University of Las Vegas, Nevada. <http://digital.library.unlv.edu/api/1/objects/nts/1178/bitstream>.
- 3 Kuran, Peter, *How to Photograph an Atomic Bomb*, Santa Clarita, CA: VCE, 2006, p 18.
- 4 Images of the immense destruction wrought by the US atomic bombing of Hiroshima and Nagasaki in August 1945 are perhaps the most powerful of their kind, yet they are lesser known, and arguably still relatively unassimilated, within US culture. By contrast, the mushroom cloud quickly ascended to American pop cultural status, as evidenced by works such as James Rosenquist's *F-III* from 1964–1965, which was painted just as the era of above-ground testing ceased. Artist Takashi Murakami has discussed the cultural importance of Hiroshima and Nagasaki and the shadow of atomic threat, both explicit and repressed, within Japanese culture in his exhibit and accompanying book *Little Boy: The Arts of Japan's Exploding Subculture*, New York: Japan Society, 2005.
- 5 Du Camp famously used a Nubian sailor named Hajj-Ishmael rather than himself or one of his travel companions as the human registrar of scale in his photos from Egypt; for more on the rhetoric of inertness, class, and racial difference within these images, see Julia Ballerini, *The Stillness of Hajj-Ishmael: Maxime Du Camp's Photographic Encounters*, New York: iUniverse Inc, 2010.
- 6 For more on tourist photography, see Richard Chalfen, "Tourist Photography", *Afterimage*, summer 1980, pp 26–29.
- 7 Sontag, Susan, *On Photography*, New York: Vintage, 1977, pp 7, 14.
- 8 One touchstone text that both affirms and complicates this notion is Rosalind Krauss, "Notes on the Index, Part I", 3 October, spring 1977, pp 68–81.
- 9 Sontag, *On Photography*, p 13.
- 10 English, Oral History, p 4.
- 11 Broad, William J, "The Bomb Chroniclers", *The New York Times*, 13 September, 2010, D1.
- 12 Kuran, *How to Photograph an Atomic Bomb*, p 38.
- 13 Kuran, *How to Photograph an Atomic Bomb*, p 71.
- 14 Quoted in Kuran, p 71.
- 15 Lippit, Akira Mizuta, *Atomic Light (Shadow Optics)*, Minneapolis: University of Minnesota Press, 2005, p 9.
- 16 Gallagher, Carole, *American Ground Zero: The Secret Nuclear War*, New York: Random House, 1993, up.
- 17 Winkler, Allan, *Life Under a Cloud: American Anxiety about the Atom*, New York and Oxford: Oxford University Press, 1993, p 91.
- 18 For more on the popular cultural reception of nuclear technology in this era, see Paul Boyer, *By the Bomb's Early Light: American Thought and Culture at the Dawn of the Atomic Age*, New York: Pantheon Books, 1985. More specific information on civil defense campaigns is found in Tracy C Davis, *Stages of Emergency: Cold War Nuclear Civil Defense*, Durham: Duke University Press, 2007.
- 19 English, Oral History, p 9.
- 20 Barthes, Roland, *Camera Lucida: Reflections on Photography*, New York: Hill and Wang, 1981, p 6.

- 21 A news photograph of a soldier brushing off nuclear fallout with a broom, from 1952, appears in Titus, *Bombs in the Backyard*, p 117.
- 22 See Fradkin, Philip L, *Fallout: An American Tragedy*, Tucson, AZ: University of Arizona Press, 1989.
- 23 Kuletz, Valerie L, *The Tainted Desert: Environmental and Social Ruin in the American West*, New York: Routledge, 1998, p xv. See also the essays in *The Atomic West*, Bruce Hevly and John Findlay, ed, Seattle, WA: Washington University Press, 1998.
- 24 Stenovec, Timothy, "George Yoshitake, Nuclear Test Photographer, Recalls Filming Nuclear Blast 55 Years Ago", *The Huffington Post*, 20 July 2012, http://www.huffingtonpost.com/2012/07/20/george-yoshitake-nuclear-test-five-5-men-nevada_n_1687233.html.
- 25 Quoted in Stenovec, "George Yoshitake, Nuclear Test Photographer, Recalls Filming Nuclear Blast 55 Years Ago".
- 26 Baggs, Albert C, "Under a Cold War Cloud: British Servicemen who witnessed post-WWII atomic tests over the Pacific blame the bomb—and the government—for a constellation of illnesses", *Time* magazine, 30 March 1998.
- 27 Gallagher, *American Ground Zero*, xxv.
- 28 Rimmer, Alan, "Curse of the A-Bomb: Ministry of Defense Deny These Troops Were Ever Exposed to Radiation, So Why Has Disease Struck Down Three of Them?", *Sunday Mirror*, 8 December 2002.
- 29 Barthes, *Camera Lucida*, p 93.
- 30 In a somewhat different realm, nuclear technologies have been fodder for fine-arts photographers who are drawn to it in part for aesthetic purposes. See, for instance, Jim Sandborn *Atomic Time; Pure Science and Seduction*, Washington, DC: Corcoran Gallery of Art, 2004; and Michael Light, *100 Suns*, New York: Knopf, 2003.
- 31 Barthes, *Camera Lucida*, p 9.