Critical Approaches to Art History (HSAR 401)
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Avoiding the sublime: Photography and the ongoing legacy of nuclear technology

by Colin Hemez

The atomic bomb introduced unprecedented visual icons to the world. The mushroom cloud rising into the stratosphere, the light of a fireball comparable in brightness only to the sun, constituted what Ronald Barthes termed "pure signs," carrying little meaning within established networks of signification. Attempts to integrate these signs within a narrative that excluded themes of destruction, radioactive fallout, and—most importantly—human agency led to the visual culture of the atomic sublime, which presents the icons of nuclear technology as natural phenomena, meant to elicit reverence and awe over fear. The atomic sublime poses challenges for photographers seeking to engage with the enormity of humanity's nuclear legacy, as it uses the global scale at which atomic events occur as the very justification for its status as a natural, non-human phenomenon.

Imagery that promotes the atomic sublime relies on strict photographic indexicality; an image of the atomic flash reimagined as a benign and beautiful "atomic dawn," for example, must not leave the meaning of any of its visual signs ambiguous. However, a small set of photographic artifacts—termed radical contact prints—attest in their physical form to the power of atomic events (be they bomb detonations or civilian nuclear reactor failures), and challenge photography's claim to indexicality. In so doing, radical contact prints challenge the integrity of the visual narratives

that constitute the atomic sublime, and introduce the possibility of alternative networks of meaning. The Japanese photographer Takeda Shimpei and the Chinese explosives artist Cai Guo-Qiang both leverage the challenge of indexicality that atomic events pose to photography in order to subvert the atomic sublime and engage with humanity's involvement in developing nuclear technology.

A New Sign: The Atomic Sublime and the Issue of Artistic Engagement

On July 16, 1945, at 5:29 a.m., the world's first atomic bomb—code-named "Trinity" by J. Robert Oppenheimer, the scientist charged with overseeing its development—detonated above the desert sands of southern New Mexico. Two hundred miles away, in Los Alamos, scientists who had participated in the development of the bomb watched the explosion from their houses. The force from the explosion shattered glass windowpanes in Silver City, one hundred and eighty miles away. The heat from the blast—some ten times hotter than the center of the sun—fused the gypsum sands of the desert floor into a new type of radioactive glass that has never formed except as a result of atomic bomb tests (the glass, green and brilliant, was aptly named "trinitite"). The mushroom cloud formed by the explosion rose more than seven and a half miles into the sky, about two miles into the atmosphere higher than Mt. Everest. Trinity's radioactive fallout traveled as far as Indiana, settling into rivers and finding its way into paper mills where it eventually contaminated the cardboard boxes used to package the Eastman Kodak Company's film (Webb 375).

The Trinity test was far from the most powerful nuclear device ever detonated, but it represents the first moment in history when human activity came to be on equal terms with natural phenomena. Witnesses to the explosion described what they saw by evoking metaphors with the natural world, and by employing a strangely spiritual vocabulary. Oppenheimer could only describe the brightness of the light emitted by the bomb in terms of a verse from the Hindu holy

book Bhagavad Gita: “If the radiance of a thousand suns were to burst at once into the sky, that would be like the splendor of the mighty one" (Jungk 201). Brigadier General Thomas F. Farrell, who watched the explosion from less than six miles away, went a step further, hailing Trinity as nothing less than the pinnacle of technological innovation and artistic creation:

> “The effects could well be called unprecedented, magnificent, beautiful, stupendous, and terrifying. No man-made phenomenon of such tremendous power had ever occurred before. The lighting effects beggared description. The whole country was lighted by a searing light with the intensity many times that of the midday sun. It was golden, purple, violet, gray, and blue. It lighted every peak, crevasse and ridge of the nearby mountain range with a clarity and beauty that cannot be described but must be seen to be imagined. It was that beauty the great poets dream about but describe most poorly and inadequately” (Groves).

Atomic explosions were unprecedented in their scale as human-instigated events. Those tasked with recording these events verbally, as Farrell suggests, struggled to find adequate terms to describe them. This difficulty extended to those seeking to make sense of the first atomic explosions visually, through photography[1]. What would become the major photographic icon of atomic visual culture—the mushroom cloud (**Figure 1**)—began its existence as what Roland Barthes has called a “pure sign,” a visual sign so unfamiliar that it resists assimilation into any existing networks of signification. The pure sign, according to Barthes, is open to “all occasions, all images, and all meanings,” and begs for acculturation through contextualization with other signs and visualities (Barthes Eiffel Tower 182). In the United States, the process of acculturation

[1] Photography and film would become an essential means for documenting nuclear tests; In 1946, at the start of Operation Crossroads, more than half of the world’s motion picture film was shipped to Bikini Atoll to record atomic explosions (Schuppli *Camera Atomica* 279). The first test of the operation, codenamed *Able*, may have been the most photographed event in human history (Curley 176).

that the mushroom cloud underwent in the decade following the Trinity test gave rise to what Peter Hales has termed the atomic sublime (Hales 5-31). As a network of meaning within the country's visual culture, the atomic sublime associates the signs of nuclear technology with those of natural phenomena, embedding the icons of the bomb within the visual culture of the grand American West. This served to remove human agency from the destruction implicit in atomic catastrophes: since nuclear explosions took place on a massive scale, and since only natural forces operated at such scales, nuclear explosions could only be natural forces, whose deleterious effects are, for better or worse, out of humanity's control (Hales 10). Tracking atomic imagery as it appeared in major American magazines, from the Nagasaki mushroom cloud of 1945 to Alan Jarlson's "Atomic Dawn" of 1953, reveals the evolution of atomic visual icons from pure signs to fully integrated members of the American atomic sublime.

The first images of the atomic bomb that were widely disseminated within the public consciousness of the United States made no attempt to place the technology within established visualities, let alone networks of meaning. They appeared as afterthoughts, secondary to the experience of witnessing the most powerful detonations in human history. In fact, the first image of a mushroom cloud to be circulated widely within the United States—that in the skies above Nagasaki, in the August 20, 1945 issue of Life magazine—was taken using a smuggled camera by a crew member aboard the airplane that dropped the bomb over the Japanese city (**Figure 2**) (Hales 5). The professional cameras onboard, meant to record the explosion more accurately, could not do so after the plane made an emergency change of course in response to the unexpected force of the explosion. Grainy, off-center, and devoid of context, the image does nothing to describe the scale of the sign, let alone the destruction incurred on the ground beneath it. The mushroom cloud

in 1945 is as much a pure sign as, Barthes argues, the Eiffel Tower was upon its completion in 1889.

But unlike the Eiffel Tower, which Barthes claims has remained "forever new," the mushroom cloud and the other photographic pure signs of atomic visual culture—the bright flash, the blast crater, the smoke trails used to track the location of the explosion's shock wave—were quickly embedded within the same rigid networks of photographic signification used to evoke experiences with nature. Alan Jarlson's photograph of a Nevada family enjoying a nuclear test twenty miles away, printed and reprinted by newspapers across the country and by the National Geographic in 1953, represents the mushroom cloud's assimilation into a visual network of American domesticity, spectatorship, and reverence for the natural world (**Figure 3**). Jarlson's composition places the flash of the atomic blast in context with the sky above and the desert landscape below. The family members, whose backs are turned to the camera, watch in fascination. Even the family cat takes a look at the atomic spectacle. The "Atomic Dawn," as the photograph's caption reads, draws associations between the signs of nuclear technology and the signs of the American West. Jarlson's image (and many similar photographs circulated within the country in the 1950's and beyond) presents a curated vision of the atomic flash, encoded within signs that suggest a subliminal—that is, awe-inspiring but characteristically non-human—experience with the natural world: grand open spaces, early light, distant but astonished human observation. Jarlson's composition draws visual parallels with the grand nineteenth-century paintings of the American West, meant not only to document the country's unexplored lands but also to present a distinctly optimistic view of mankind's relationship to the natural world (**Figure 4**).

The assimilation of the signs of nuclear technology into the visual culture of the American sublime serves a political purpose. As Mieke Bal and Norman Bryson note in their essay

"Semiotics and Art History," "the field in which struggles over meanings are fought is a social arena where power is at stake" (Bal and Bryson 207). Signs are subject to changes in meaning, and pure signs are subject to assignments of meaning. This process, Bal and Bryson argue, involves demonstrations of power; those with influence can control the meaning of the sign, thereby controlling its position within networks of signification as well as its ideological role within society. Perhaps fortuitously for the American government and its forthcoming involvement in the ideologically-driven Cold War, the tendency for witnesses of early atomic explosions to describe their experience in terms of natural phenomena provided a straightforward way to promote the atomic sublime—and thus to hide the government's agency in creating and deploying the most destructive device the world had ever seen. The United States Atomic Energy Commission made an active effort to embed atomic signs within the visual vocabulary of American tourism in the late 1950s and early 1960s, going so far as to design its Nevada test schedule around the most popular tourist seasons. Tourists and families "interested in seeing a nuclear explosion can adjust their itineraries accordingly" (Hales 30).

As a visual medium, photography was particularly important for the creation of a sublime atomic visual culture; images of nuclear tests in Nevada (and, later, in the distant paradise of Bikini Atoll) could be easily disseminated within newspapers and periodicals. Immediately following the bombings of Hiroshima and Nagasaki, the U.S. government circulated photographs of scientists at work on the Manhattan project, seeking to present the development of the atomic bomb as an endeavor no different from any other clean, cutting-edge, and essential scientific project (Freeman 163). "Everything's under control in the control room," writes Hales. Anticipating Bazin's theories in his Ontology of the Photographic Image, the government also capitalized on the perception of photography as a realistic and indexical medium. "Photography," writes Bazin, "enjoys a certain

advantage in its transference of reality from the thing to its reproduction" (Bazin 8). Photographs, cannot be anything but real, so images that present atomic visual icons amongst the signs of the sublime must be recording nothing more than a grand, natural, and characteristically non-human event.

The atomic sublime, then, poses a particular challenge for photographers seeking to engage with humankind's complicity in the development of nuclear technology. Attempts to describe the enormity of the problem using signs and metaphors operating on planetary scales—an atomic flash as bright as the sun, a mushroom cloud many times taller than Mt. Everest, a radioactive fallout dispersed across the globe—are only contextualized through natural phenomena, evoking the atomic sublime. The atomic sublime, in turn, embeds atomic signs within a distinctly benign, domestic, and American negation of the bomb's destructive power (**Figure 5**)[2]. According to the atomic visual sublime, the very size of the bomb neutralizes its potential to be man-made. How, then, do photographers engage with the enormity of humanity's nuclear legacy without acknowledging a reverence for its scale?

Nuclear Technology's Challenge to Photography

A particular body of photographic work seems to evade neutralization by the atomic sublime. Extant since the first few microseconds after Trinity's detonation, these photographs demonstrate the challenge that nuclear events—be they bomb detonations or major catastrophes of civilian nuclear reactors—pose to recording on photographic film. Artist and cultural theorist Susan Schuppli uses the term radical contact prints to describe these images, whose formal characteristics attest to the physical violence of nuclear catastrophes (Schuppli Camera Atomica

[2] Roy Lichtenstein's 1966 rendition of the mushroom cloud, approaching the form of a chef's hat more than that of a powerful explosion, takes the atomic benign to nearly to the point of abstraction. Here, the artist's famous Ben-Day dots appear as individual atoms, both the generative source of the explosion and the neutral backdrop for the decontextualized atomic seascape.

279). The underlying mechanism for the existence of radical contact prints is the intense energy emitted not just by atomic explosions, but also by such nuclear catastrophes as those at Three Mile Island, Chernobyl, and (most recently) Fukushima, Japan.

In Camera Lucida, Barthes claims that

> "[t]echnically, photography is at the intersection of two quite distinct procedures; one of a chemical order: the action of light on certain substances; the other of a physical order: the formation of the image through an optical device. It seemed to me that the Spectator's Photograph descended essentially, so to speak, from the chemical revelation of the object (from which I receive, by deferred action, the rays), and that the Operator's Photograph, on the contrary, was linked to the vision framed by the keyhole of the camera obscura" (Barthes Camera 10).

The photograph according to the viewer (what Barthes calls the Spectator's Photograph) is predicated on the reliability of certain chemical processes that encode light onto a planar surface—that is, film—within the camera. The Operator's Photograph, by contrast, involves the physical act of placing the camera on the scene, framing the shot, triggering the shutter. The chemical processes, by virtue of their reliability, enable reproducibility—they enable, in short, an indexical relationship between the Spectator's Photograph and the Operator's Photograph. What the photographer sees at the site of the photographic event is chemically encoded onto the film, allowing events in the exterior world to embed themselves as signs within the camera. Radical contact prints, by contrast, destroy the chemical-physical relationship of photographic indexicality by recording radiation (whether in the form of intense heat or radioactive particles) directly onto the film.

To be sure, the atomic bomb posed significant formal—or in Barthes's terms, physical—challenges to photography. As Brigadier Farrell vividly conveys in his description of the Trinity test, the brightness of the blast was difficult to comprehend, let alone to predict. In fact, only one properly-exposed color photograph of the Trinity test is known to exist; all others were overexposed (**Figure 6**). Proper exposure constitutes a technical challenge, but does not give rise to a radical contact between the exterior world and the photographic medium. The impressive brightness of Trinity and other nuclear tests was soon tamed, domesticated (**Figure 3**), and aestheticized (**Figure 1**). In a radical contact print, according to Schuppli, the heat and radioactivity emitted from the nuclear event violates the barrier between the Operator's physical photograph and the Spectator's chemical photograph: "Unlike the image of the mushroom cloud, which separates the visual field from the material conditions that it documents, the radiological contact print is immanent to and continuous with the event. By this I mean that the violence out of which the image emerges is directly encoded in the image as the very means by which it comes into the world" (Schuppli Camera Atomica 280-281).

Trinity did give rise to radical contacts between the nuclear event and the photographic material in a set of photographs taken during the first few milliseconds of the explosion. These images, beyond being simply overexposed, display black pockmarks on their surface (**Figures 7 and 8**). The pockmarks are not artifacts of the explosion, like calm eyes in the centers of hurricanes; they are instead the direct result of the heat from the explosion burning through photographic film. In these images, the camera lens effectively focuses the heat given off in the first moments of the explosion onto the film, in the same way that a magnifying glass can light newspaper on fire on a sunny day. In a cruel twist of process, the physical design of the camera works to literally destroy the film's chemical reliability.

Radical contacts have also taken place as a result of civilian nuclear reactor failures. Russian filmmaker Vladimir Shevchenko's Chernobyl: Chronicle of Difficult Weeks documents the immediate aftermath and initial decontamination efforts after the Chernobyl disaster occurred on April 26, 1986. Created three days after the explosion and meltdown Reactor Unit 4, the film contains a brief overhead shot of the nuclear reactor that Shevchenko recorded through an open window aboard a radiation-shielded helicopter (**Figure 9**). Upon developing the film, Shevchenko noticed that the film had developed pockmarks similar to those of the burned Trinity images, and that the sound reel of the film contained heavy static. Initially thinking that the film was defective, Shevchenko later realized that he had captured the very effects of radioactivity acting on the film's surface. Radioactive particles interacted with the light-sensitive chemicals of the film, causing the pockmarks. The material of the film itself—irradiated to such a degree that it is considered, without exaggeration, to be the "most dangerous film in the world"—continues to exert its distortional effects on the film, adding new pockmarks and changing the sonic profile of the film on a daily basis (Schuppli "The Most Dangerous" 128). Terrifyingly alive, Chronicle of Difficult Weeks negates the possibility that the visual content of the film is an indexical trace, supplanting instead the reality that the film's material interacts directly with the material content of the world at large.

Far from photographic in the traditional sense, the radical contact print evokes an uncanny closeness to experience, blurring the distinction between representation and event, trace and truth. The "atomic shadows" of human bodies vaporized during the atomic bombings of Hiroshima and Nagasaki, scorched into the concrete surfaces of the city (**Figure 10**), demonstrate that the energy emitted by the bomb circumvents the need for a chemical mediator localized within the photosensitive layer of photographic film. Tragically, the atomic bomb turns the entire surface of the Earth into a photographic plate.

Radical contacts are not limited to images of extreme nuclear events; in fact, they were instrumental to the discovery of radioactivity itself. In 1896, Henri Becquerel, a Parisian scientist, was investigating the action of naturally fluorescent minerals on photographic plates, believing that uranium salts, upon exposure to sunlight, could convert light into x-rays that could penetrate through paper and onto the photographic plate. In February, an overcast winter day forced him to put away his materials in a dark drawer. For reasons unknown, Becquerel decided to develop these plates anyway; to his surprise, the plates showed a clear imprint in the shape of his uranium salt sample (**Figure 11**). From its first moments within scientific consciousness, radioactivity has had an intimate and essential relationship with photography (Fournier 51).

By breaking down the physical-chemical barrier that underlies the indexicality of photographic processes, radical contact prints resist classification as representations of events or as historical traces. Rather, they constitute events in and of themselves, direct and dynamic artifacts of interactions between the components of the material world (Schuppli Camera Atomica 289). The visual fidelity of radical contact prints cannot be guaranteed; as with Shevchenko's film, radiation continually changes the visual content of the object itself. The visual forms contained within radical contact images, then, cannot be static signs, with fixed meanings and fixed sets of associations. Fortunately, Bal and Bryson provide an alternative formulation of the sign: "To think of semiosis as process and as movement is to conceive the sign not as a thing but as an event, the issue being not to delimit and isolate the one sign from other signs, but to trace the possible emergence of the sign in a concrete situation, as an event in the world" (Bal and Bryson 194). The sign-as-event is specific to time and place, open to definition and reevaluation at each instance of its (re)emergence. According to this formulation, then, each iteration of Shevchenko's film—each moment in which a radioactive particle emits from one part of the film's material and embeds itself

in another—constitutes a new sign. By embodying the sign-as-event, the radical contact print resists any incorporation within a static network of representational meaning, and instead welcomes its own decontextualization—its status as a pure sign that, as Barthes suggests, remains forever new.

In subverting static codes of signification in favor of dynamic visual instability, radical contact prints question photography's claim to indexicality, especially with regards to the representational recording of atomic events on film. Indeed, radical contact prints question the very identity of signs within atomic imagery, suggesting instead that atomic imagery is a series of ever-changing events that cannot be assimilated into static networks of meaning (or into immortalized narratives that inform such visual readings as the atomic sublime). From the technical challenges that nuclear events pose to photography—manifested in the radical contacts between heat and camera, radiation and film, bomb and body—arises the opportunity to explore alternative networks of signification that extend beyond strict visual metaphor. Oppositional visualities emerge: instead of conveying the enormity of humanity's nuclear legacy through expansive forms and grand landscapes, photographers confront the tremendous scale of nuclear events by questioning the scales at which they actually occur. Rather than focus on the sky—the site of the mushroom cloud, the medium through which radioactivity disperses and light penetrates (in short, the very home of the atomic sublime)—photographers examine the ground. Negating realism or a rigid arrangement of visual signs to create a closed narrative, photographers emphasize the abstraction and decontextualization of signs.

Avoiding the Sublime

The radical contact print demonstrates the technical and ontological challenges posed to photography as a medium, and preserves the visual elements of atomic imagery as pure signs that

resist incorporation into static networks of meaning and narrative. Such materials as the burnt photographs taken in the first few moments of the Trinity detonation and Shevchenko's Chernobyl film cast doubt on the integrity of the signs that make up the atomic sublime—the mushroom cloud, the expansive landscape (or paradisiacal seascape, in the case of Bikini Atoll), the golden light, the spectacle in the sky as opposed to the destruction on the Earth. Contemporary artists evoke the atomic bomb's challenge to photography, as well as the instability of the signs of the atomic sublime, to investigate humanity's involvement in the global legacy of nuclear technology. Some, such as the Japanese photographer Takeda Shimpei, make use of the photo-active properties of radioactivity to evoke issues of scale and memory. Others, like the Chinese artist Cai Guo-Qiang, work directly with the unstable nature of atomic signs, decontextualizing and recontextualizing them to highlight the fluidity of the meaning they carry.

Takeda Shimpei uses radioactivity to subvert the traditional processes involved in capturing and developing a photographic image; he notes that, using instant film, radiograms can be produced "without having a darkroom, developing trays, or chemicals" (Takeda "Trace"). His Trace series, produced between 2012 and 2014 as an attempt to "capture the current state of Japan directly," makes use of soil contaminated with radiation as a result of the Fukushima Daiichi nuclear catastrophe in March and April of 2011 (**Figure 12**). Takeda collected soil samples from twelve historically significant sites that contain "a strong memory of life and death" located in and around Fukushima prefecture (including shrines, sites of battles, and his own birthplace). He then arranged the soil on photographic plates, auto-exposed them for a month, and developed the plates into prints (Takeda 89).

Takeda is concerned with creating "a physical record of the catastrophe" using soil, a material whose deep connection to the natural world serves as a record of human activity.

According to the artist, changes in the physical composition of soil serve as indications that human activity is just as influential in changing the material of the Earth as are natural forces themselves. Takeda casts away all visualities, including that of the atomic sublime, in favor depicting a direct physical experience with the consequences of nuclear disasters through a quasi-photographic process[3]. The Trace series also makes use of the oppositional forces that emerge from the instability of the signs that constitute the atomic sublime—the ground is the primary material of Takeda's work, and functions not as a sign among others that is to be connected into a network of meaning, but as the very entity that collapses, in Schuppli's words, "the gap between representation and the real, form and content, signification and affect" (Schuppli Camera Atomica 287). The visual form of Takeda's final products also conflates scale. The prints' similarity in appearance to images of star clusters taken by the Hubble Space Telescope draw an eerie parallel between the small but significant events of radioactive emission on the photographic plate and the tremendous scale of nuclear fusion occurring within stars thousands of light-years away.

Takeda faced the same difficulties of exposure that challenged all but one of the photographers at the Trinity test in 1945. The artist calculated roughly the amount of time he would need to leave the soil arranged on the plate based on Geiger counter measurements of the radioactivity of his soil samples, but it remained a trial-and-error process. For each underexposed radiogram, Takeda would need to discard the photographic print and start again. Each image in the series represents Takeda's physical act of arranging soil onto the photographic plate as—in Bal's and Bryson's terms—a "concrete situation" rather than as a "thing" (Bal and Bryson 194).

[3] While it avoids the atomic sublime, Takeda's *Trace* series harkens to a number of existing nuclear visualities, including Becquerel's discovery of radioactivity (**Figure 11**) and—more significantly—the radio-autographs created using cross-sections of fish around Bikini Atoll during Operation Crossroads. Scientists created these images to track the dispersal of radioactivity within the marine environment, as well as to gauge the concentration of radioactive particles within the bodies of living organisms. The scientists preferred using puffer fish, because their flat profile, when deflated, closely resembles that of a photographic plate (Schuppli *Camera Atomica* 279).

The traces remaining on the correctly-exposed plates are themselves events, artifacts of spontaneous radioactive decay whose occurrence is determined by random Poisson dynamics. The reproducibility of Takeda's images, then, lies not in a chemical fidelity that encodes a referent from the outside world, but rather on the reliability of random radioactive decay. Trace negates Barthes's distinction between the physical and chemical processes in photography, emphasizing the event-making capabilities of the photographic material itself rather than the image-making capabilities of the photographic apparatus (that is, the camera). Accordingly, Takeda's critical conclusion for his project is nothing more than the obvious: "Invisible particles left a trace on photographic materials. I wish I didn't need to face these prints" (Takeda "Trace").

Chinese artist Cai Guo-Qiang is well aware of the sublime power of atomic visualities; for him, the atomic bomb led to the most destructive moments in human history, and yet produced "monumental and beautiful" imagery that overshadows the greatest artwork of the twentieth century (Tufnell). Cai's The Century with Mushroom Clouds: Project for the 20th Century (1995-1996) investigates the unresolved power of atomic visualities by emphasizing the instability of atomic visual signs. The project is the first major work that Cai produced after moving permanently to New York City in 1995, through a residency at the Museum of Modern Art's PS1 Studio Program (Cai 156). In an exercise that he calls "fighting fire with fire," Cai uses destructive media—such as explosives, gunpowder, and fireworks—to explore resonances and dissonances with historically significant moments of destruction. For The Century with Mushroom Clouds, Cai developed handheld explosives that he detonated at various sites of atomic and artistic significance around the United States, creating miniature mushroom clouds that engage with the landscape in diverse ways (**Figure 13**).

As Shevchenko's Chernobyl film demonstrates, radical contacts between photographic materials and atomic events cast doubt on indexicality and visual fidelity. This, in turn, challenges the status of atomic imageries as signs that can be embedded within static networks of meaning. Cai's project elaborates on the instability of the mushroom cloud as a sign, using scale to explore the range of meanings that the sign can have beyond its function within the atomic sublime. In the photographs taken from the detonation events of The Century with Mushroom Clouds, scale acts as the radical mediator that confuses event, sign, and visual meaning. Photographic techniques are complicit in Cai's use of variable scale: although each handheld mushroom cloud is of roughly the same size, Cai strategically places his camera relative to himself and his surroundings so as to evoke a wide range of imaginary scales. The relative scale of the detonation within each context (from domestically small to monumental) gives rise to a diversity of meanings and emotional responses (from benign indifference to cataclysmic despair). Next to a model house at the Nevada Test Site, the mushroom cloud becomes a puff of cigarette smoke; near Robert Smithson's Spiral Jetty, it becomes a geyser; in front of the Manhattan skyline, the handheld explosive becomes a terrorist attack. As Bal and Bryson note, "it cannot be taken for granted that the evidence that makes up 'context' is going to be any simpler or more legible than the visual text upon which such evidence is to operate" (Bal and Bryson 177). In leveraging the instability of the mushroom cloud as an atomic sign, Cai explores the complex interactions between this visual text and its many potential contexts.

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In No Place to Hide, a memoir from his time as a radiation scientist for Operation Crossroads, David Bradley notes the extent to which the traces of nuclear technology—the radioactive particles themselves—had unified the world:

> "We can't predict to what degree the balance of nature will be thrown off by atomic bombs… Bikini is not some far away little atoll pinpointed on an out-of-the-way chart. Bikini is San Francisco Bay, Puget Sound, East River, it is the Thames, the Adriatic, Hellespont, and misty Baikal" (Bradley 149).

Through the atomic bomb, human activity came to be just as powerful as natural phenomena in shaping the very material composition of the Earth. The atomic bomb introduced a new collection of pure signs to the world, visual forms so unprecedented that they lacked meaning and resisted incorporation into networks of signification. The culture of the atomic sublime arose as an attempt to contextualize the signs of nuclear technology—the mushroom cloud, the bright flash—within visualities that championed a reverence for nature and a denial of human agency. In order to maintain such strict visual codes of meaning, the atomic sublime takes photographic indexicality as its premise.

However, a subset of photographic materials produced from attempts to record nuclear events—the radical contact prints—resist assimilation into the atomic sublime. These radical contacts do not record the signs of nuclear technology; rather, they are continuous with the nuclear event itself, and collapse photography's claim to indexicality by refusing definition as static signs within a coded visual paradigm. Contemporary photographers leverage the ontological challenge that atomic events pose to photography in order to circumvent the atomic sublime and to investigate humanity's responsibility to the world's ongoing nuclear legacy.

Figures

Figure 1: Grable Atomic Test, Nevada Test Site (May 25, 1953). Yield: 15 kT.

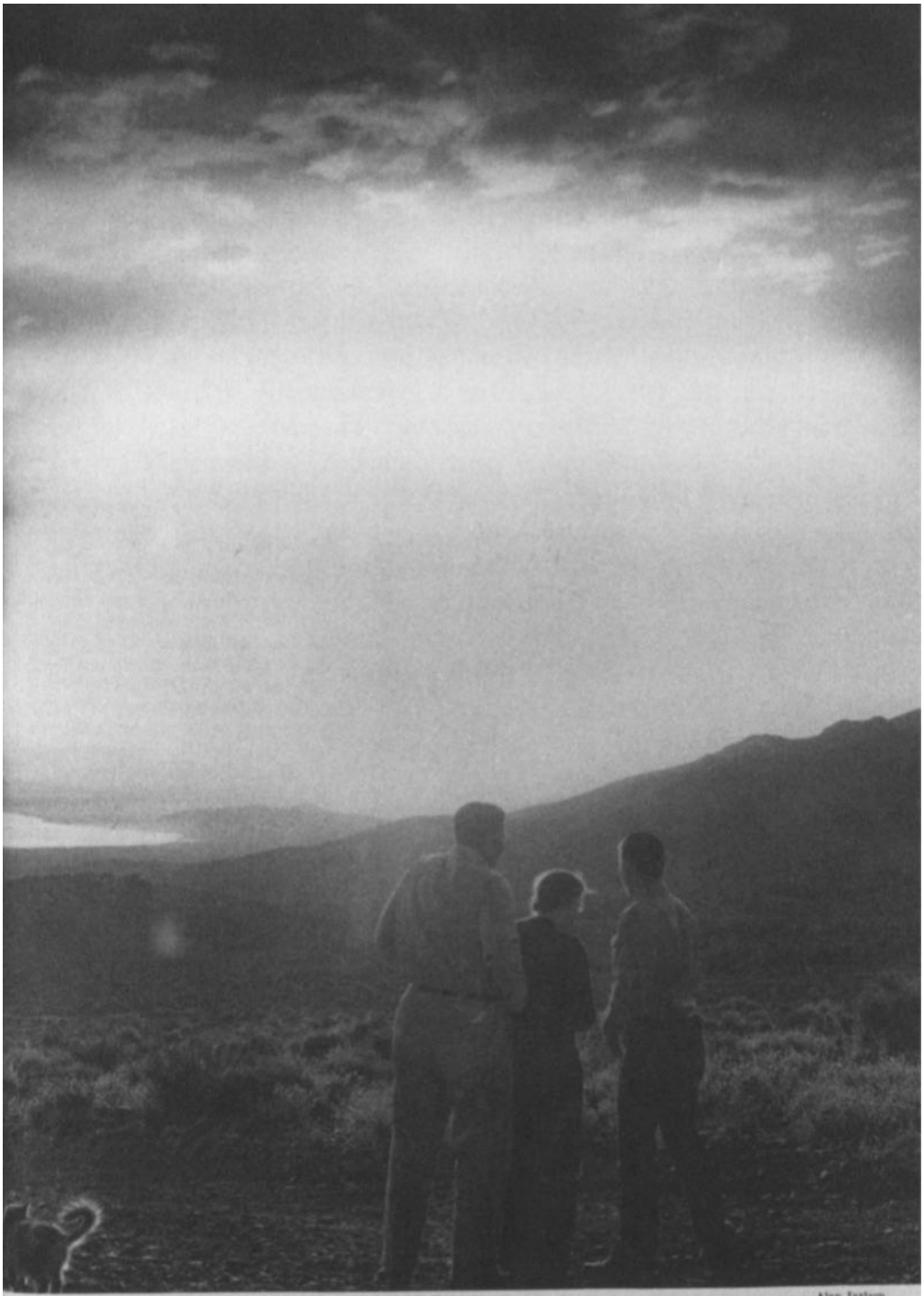
NAGASAKI
ATOM BOMB NO. 2 DISEMBOWELED IT

Seventy-five hours after the world's first atomic bombing, an interval marked by President Truman's demand for unconditional surrender, the second bomb was dropped on Nagasaki, shipbuilding port and industrial center. This bomb was described as an "improved type," easier to construct and productive of a greater blast. It landed in the middle of Nagasaki's industries and disemboweled the crowded city. Unlike the Hiroshima bomb, it dug a huge crater, destroying a square mile—30% of the city.

When the bomb went off, a flier on another mission 250 miles away saw a huge ball of fiery yellow erupt. Others, nearer at hand, saw a big mushroom of smoke and dust billow darkly up to 20,000 feet (*above*) and then the same detached floating head observed at Hiroshima. Twelve hours later Nagasaki was a mass of flame, palled by acrid smoke, its pyre still visible to pilots 200 miles away.

The bombers reported that black smoke had shot up like a tremendous, ugly waterspout. Physicists at the bomber base theorized that this smoke was the pulverized fragments of the Mitsubishi Steel and Arms Works. With grim satisfaction they declared that the "improved" second atomic bomb had already made the first one obsolete.

Figure 2: *Life* (August 20, 1953).



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Alan Jarlson

Atomic Dawn, Many Times Noon's Brightness, Greets a Nevada Family 20 Miles Away

Nobody lives closer to the Yucca Flat test site than the Sheahans, who have watched a number of nuclear tests from their lonely Groom Mine property. Cleo the cat (left) let out a shrill meow and scurried for shelter after this blast. One Nevada atomic flash was seen as far away as Kalispell, Montana, 780 miles north.

Figure 3: Alan Jarlson, "Atomic Dawn, Many Times Noon's Brightness, Greets a Nevada Family 20 Miles Away." *National Geographic* (1953).

Figure 4: Albert Bierstadt, “Yosemite Valley, Glacier Point Trail,” ca. 1873. Oil on canvas, 137 x 215 cm. Yale University Art Gallery (1931.389).

Figure 5: Roy Lichtenstein, “Atomic Landscape,” 1966. Oil and acrylic on canvas. Private collection.

Figure 6: Jack Aeby, “Trinity Atomic Test, New Mexico,” July 16, 1945. Yield: 20 kT.

Figure 9: Vladimir Shevchenko, stills from “Chernobyl: Chronicle of Difficult Weeks,” 1986.

Figure 10: Atomic shadow, scorched into the concrete of Hiroshima.

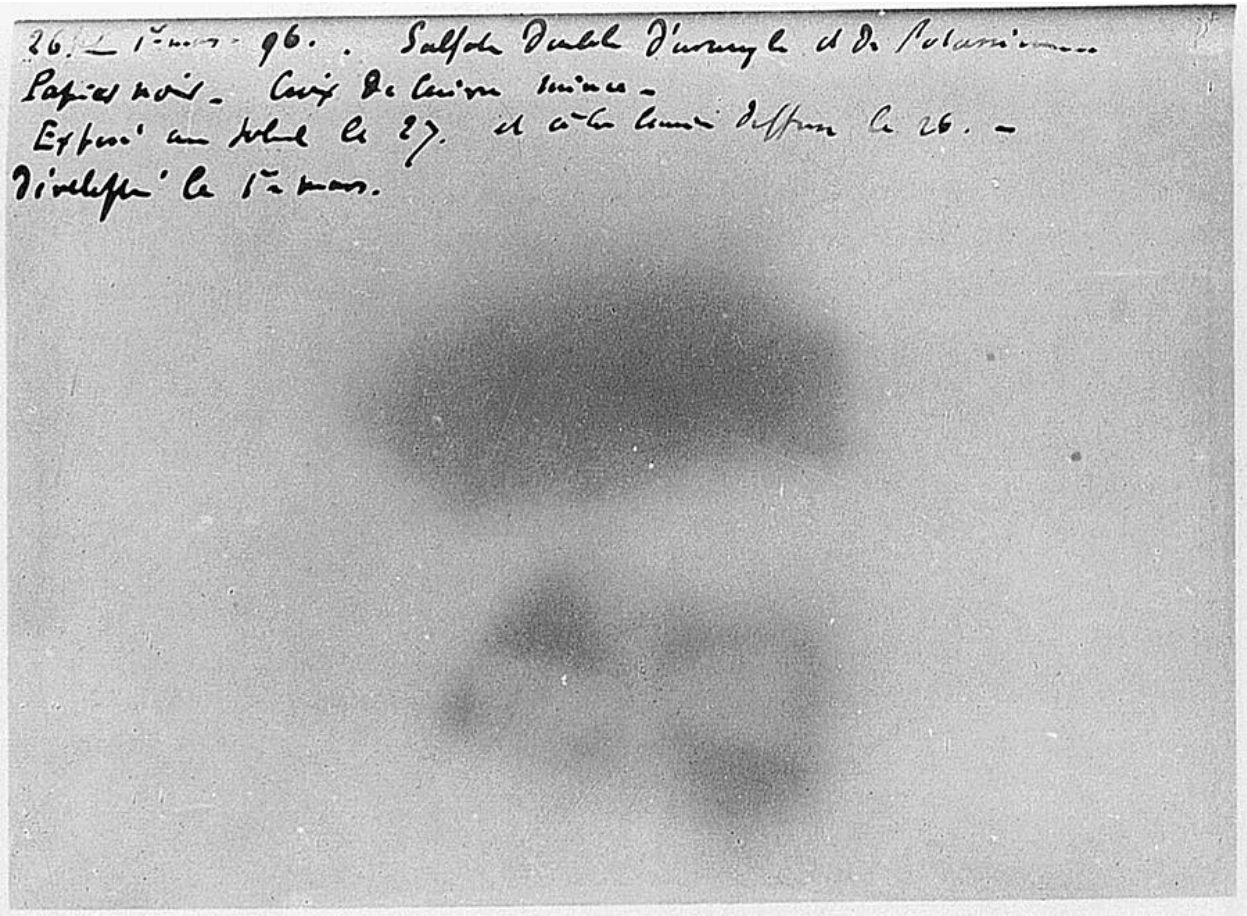

Figure 11: Henri Becquerel, “Ghostly image of a metal object generated by spontaneous radioactivity,” 1896. Lumière photographic plate.

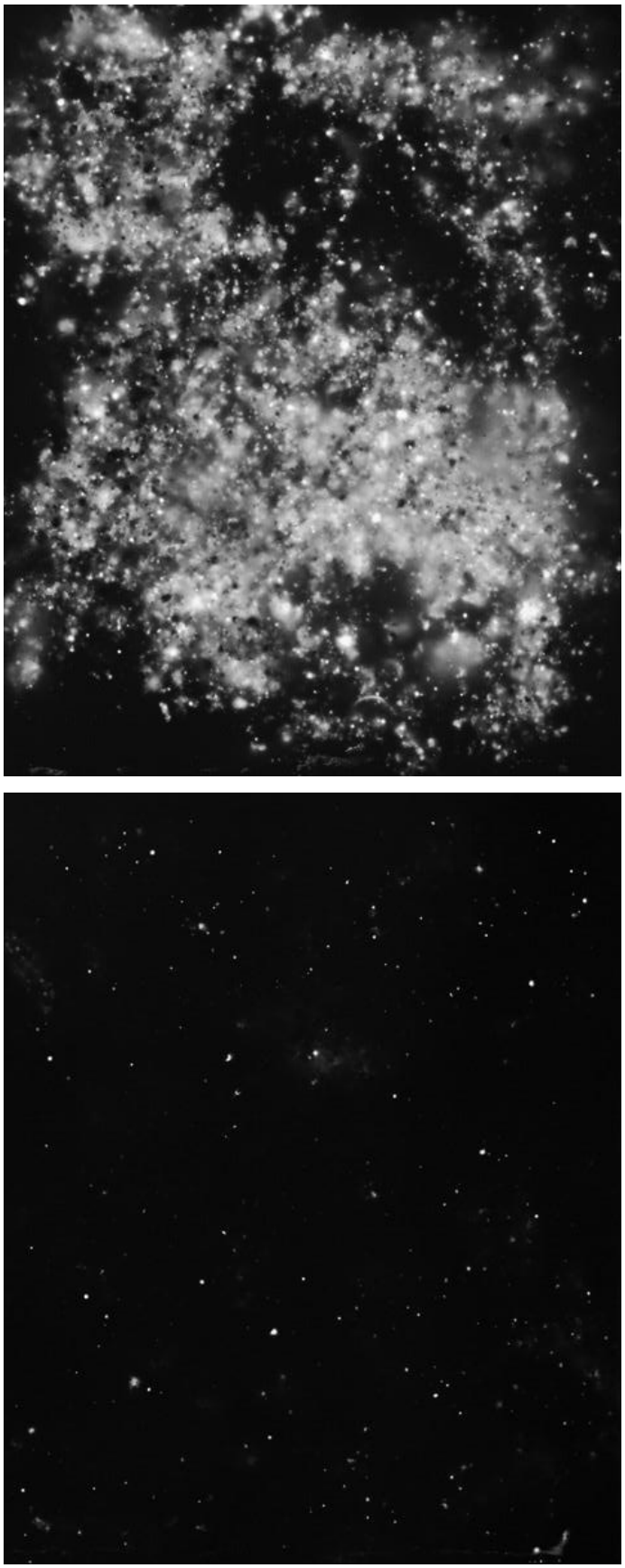

Figure 12: Takeda Shimpei, "Trace 9" (left) and "Trace 16" (right), 2012-2014. Gelatin silver print (Made from radioactive soil on a photographic plate), 20 x 25 cm.

Figure 13: Cai Guo-Qiang, “The Century with Mushroom Clouds: Project for the 20th Century,” 1996. Explosion event, dimensions and locations variable. Locations of selected photographs (counterclockwise from top left): Nevada Test Site; Nevada Test Site; New York, NY; Robert Smithson’s “Spiral Jetty,” Salt Lake, Utah.

References

Bal, Mieke, and Norman Bryson. "Semiotics and Art History." *The Art Bulletin* June 73.2 (1991): 174-208. JSTOR. Web. 23 Sept. 2016.

Barthes, Roland. *Camera Lucida: Reflections on Photography*. Trans. Richard Howard. New York: Hill and Wang, 1981. Print.

Barthes, Ronald. *The Eiffel Tower and Other Mythologies*. Trans. Richard Howard. N.p.: U of California, 1997. Print.

Bazin, André. "The Ontology of the Photographic Image." Trans. Hugh Gray. *Film Quarterly* Summer 13.4 (1960): 4-9. JSTOR. Web. 09 Dec. 2016.

Bradley, David Vernard. *No Place to Hide*. Boston: Little, Brown, 1948. Print.

Cai, Guoqiang, Thomas Krens, and Alexandra Munroe. *Cai Guo-Qiang: I Want to Believe*. New York: Guggenheim Museum, 2008. Print.

Curley, John J. *A Conspiracy of Images: Andy Warhol, Gerhard Richter, and the Art of the Cold War*. New Haven: Yale UP, 2013. Print.

Fournier, Paul, and Josette Fournier. "Hasard Ou Mémoire Dans La Découverte De La Radioactivité?" *Revue D'histoire Des Sciences* Spring 52.1 (1999): 51-79. JSTOR. Web. 10 Dec. 2016.

Freeman, Lindsey A. *Longing for the Bomb: Oak Ridge and Atomic Nostalgia*. Chapel Hill: U of North Carolina, 2015. Print.

Groves, Leslie. "Report on the Trinity Test by General Groves - 1945." *Atomic Archive*. AJ Software, 1998. Web. 10 Dec. 2016.

Hales, Peter B. "The Atomic Sublime." *American Studies* Spring 31.3 (1991): 5-31. JSTOR. Web. 18 Nov. 2016.

Jungk, Robert. *Brighter than a Thousand Suns: A Personal History of the Atomic Scientists*. New York: Harcourt Brace, 1958. Print.

Schuppli, Susan. "The Most Dangerous Film in the World." *Tickle Your Catastrophe*. Ghent: Ghent U, 2010. 128-41. Print.

Schuppli, Susan. "Radical Contact Prints." *Camera Atomica*. Ed. John O'Brian. Toronto: Art Gallery of Ontario, 2015. 278-91. Print.

Takeda, Shimpei. "Shimpei Takeda." *In the Wake: Japanese Photographers Respond to 3/11*. Ed. Anne Nishimura Morse. Boston: MFA Publications, 2015. 88-93. Print.

Takeda, Shimpei. "Trace." *Shimpei Takeda*. Shimpei Takeda, 2016. Web. 5 Dec. 2016.

Tufnell, Ben. "Atomic Tourism and False Memories: Cai Guo-Qiang's The Century with Mushroom Clouds." *Tate Papers*. Tate, 2012. Web. 10 Dec. 2016.

Webb, J. H. "The Fogging of Photographic Film by Radioactive Contaminants in Cardboard Packaging Materials." *Physical Review* 76.3 (1949): 375-80. APS Journals Archive. Web. 11 Dec. 2016.