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Atomic Animals: Toward the Re-invention of Natural History and Science Filmmaking

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The application of the productive field of critical theory known as nuclear criticism to film has heretofore centered either on documentaries directly pertinent to atomic culture—for example, *The Day After Trinity* (Jon Else, 1981)—or, at a more allegorical level, to fiction films. In film studies, a discipline dominated by attention to narrative cinema, the most engaging work in this area reads films of the 1950s as representations contaminated by the possibility of nuclear devastation. Alexander Hammond links the discourses of nascent atomic civilization with the popular Hollywood science-fiction film, *The Beast from 20,000 Fathoms* (Eugene Lourie, 1953).[i] In an even more allegorical critical move, Mark Osteen links the paranoia of post-war film noir to the nuclear threat described by Hammond and others.[ii] However, if Robert Jay Lifton and Greg Mitchell are correct, the Hiroshima event remains a "raw nerve" in contemporary American culture, and we should find evidence of its traumatic effects across a wide span of cultural artifacts.[iii]

Working from the "outside" of two disciplines, both natural history and science filmmaking, as well as science itself, I here take seriously Lifton and Mitchell's method in *Hiroshima in America: Fifty Years of Denial*. The authors claim that "you cannot understand the Twentieth Century without Hiroshima" because the event "casts a shadow on every aspect of our personal and collective existence".[iv] To defend Lifton and Mitchell's assertion, I want to examine an unlikely filmic space for finding the effects of nuclear trauma, contemporary natural history films as presented on the Discovery Channel. While I will focus on a particular episode of *PaleoWorld*, "Armored Dinos" (1996), because it is the most egregious example, this essay asserts that such nuclearism contaminates even the "blue chip" animal films that are the hallmark of Discovery's programming, such as *Lion Battlefield* (BBC/Discovery, 2003).

I teach in a M.F.A. program devoted to the production of science and natural history films in which the students bridge what C.P. Snow called, in 1959, "the two cultures."[v] The program is set up to dismantle two significant inside/outside binary oppositions. By bringing scientists "inside" the academic world of film studies and production, our hope is that these students will bring a critical artistic perspective to bear on the representation of science. Conversely, as scientists, our students can talk professionally with the subjects of their films; with this model, no longer will scientists see filmmakers as "outsiders" threatening their domain with narrative frippery.

In developing a science studies course for the program, I wanted to provide a forum where students could learn to analyze existing science—*Cosmos* (Adrian Malone, 1980) and *Connections* (Mick Jackson, 1979)—and natural history (*Wild Discovery*, *Nature*) television programming using the advanced tools of criticism in media studies. Second, I wanted to demonstrate to students that the methods of the humanities that they as scientists had been taught to disdain (for example, deconstruction) could usefully serve to assess science. It is this latter path that led me directly to nuclear criticism.

At the foundational event of this interdisciplinary method, a 1984 conference held at Johns Hopkins University, Jacques Derrida delivered a speech, entitled, "No Apocalypse, Not Now."[vi] Derrida's lecture, deconstructing the concept of nuclear criticism before its academic status had even been established, is a beautiful example of highly theoretical humanities criticism. Derrida playfully, yet with vicious irony—he addresses "what is still now and then called humanity"—argues that literary critics have just as much authority to talk about nuclearism as do atomic scientists because of the unique "destruction of the archive" threatened by atomic devastation.[vii] The opportunities thus provided by nuclear criticism fit my class perfectly: simultaneously, I could teach my graduate students an important method in the humanities, deconstruction, while also grappling with a prime site in the study of science and technology, the Hiroshima event.

What I did not expect, and which serves as the subject of my essay, is that nuclear criticism would be just as relevant to natural history films about animals as it is to the films I had deliberately chosen to illuminate my lecture on nuclear criticism. The first time I taught the class, in 2002, I showed the episode of *Watch Mr. Wizard* (1955) in which Don Herbert explains to his young charge how the newly developed hydrogen bomb works. He uses a small chalk model to create a mushroom cloud in his living room, thus serving to demonstrate on television what nuclear critic Carol Cohn details as American culture's obsessive attempts to "domesticate" the bomb (Cohn's best example is that the bomb's missile delivery vehicles are referred to as R.V.s, as if they are meant for a family trip to Yellowstone).[viii] I also showed the episode of *Cosmos* ("Who Speaks for Earth?") in which Carl Sagan uses the destruction of the library at Alexandria as a way of warning about the effects of nuclear winter on the future of human civilization. This is a particularly potent moment in my class, as Sagan's diatribe against deconstruction in his "Antiscience" chapter in *The Demon-Haunted World* turns out not to be as justified as he indicates.[ix] For Derrida's and Sagan's lament at nuclear war's threat to the archive ends up having more in common with each other than Sagan allows. {LINK CLIP #1 HERE: Caption: "*Cosmos*: The lunacy of nuclear war." Copyright: Cosmos Studios, 2000}.

In my class, despite the program's focus on documentary cinema, I also make the typical moves that any film scholar would regarding nuclear criticism, an application of its techniques to Hollywood fiction films. Derrida's "No Apocalypse, Not Now" fuses a discussion of nuclearism with religion—by parodying the seven seals from the Book of Revelations via "seven missiles/seven missives"—as does the ending of *Beneath the Planet of the Apes* (Ted Post, 1970) in which the subterranean survivors of Earth's nuclear war worship the atomic bomb. Similarly, I use the famous apocalyptic ending of *Kiss Me Deadly* (Robert Aldrich, 1955) in which Pandora opens up a nuclear box, killing the noir's male villain, as a way of engaging the feminist dimensions of nuclear criticism. In "From Secrets of Life to Secrets of Death," Evelyn Fox Keller proposes a model of male birthing, in which nuclear scientists suffer from

"womb envy" in their desire to create; the result, ironically, is that they fail to produce life, and instead devise only the technological ability to destroy it altogether.[x]

Now when I teach the course, I quickly move through this more traditional and obvious work so that I can reveal the ways that nuclearism contaminates seemingly non-ideological contemporary natural history culture, such as that presented on the successful basic cable outlet, the Discovery Channel. There is no more fascinating, and egregious, example of nuclear contamination of our culture as that presented in the "Armored Dinos" episode of *PaleoWorld.* Part of the "Prehistoric Planet" package on The Science Channel (one of Discovery Networks' basic cable spin-off channels), the film was produced in 1996; the copy I used for study aired April 7, 2002. I want to analyze this short film in detail because it is as over-determined an example as an academic critic could ever hope for. *PaleoWorld* suffers from the juvenile gestures of anthropomorphism that haunt the entire history of the representation of animals in the cinema. Even before the show proper has begun, these gestures position the spectator's experience with science and nature as one which directly is directly analogical. In a bumper, a male voice-over announcer declares, "And you thought your neighborhood was rough," alluding to the fierce dinosaurs which we are about to encounter. The bumper also infantilizes the audience by assuming that one experiences his or her neighborhood as a battle zone, a feeling I myself have not had since was twelve years old, as I rode my bike around the neighborhood, and got beat up by the bullies. The infantilization of science via dinosaurs is, of course, endemic to this culture: my four- and eight-year old boys know more about dinosaurs than I ever will. However, if I were to try to explain to them how the Nineteenth Century invention of the telegraph was used to secure the British imperial control of India, they would tune out immediately.

Directed by Alex West and written by Georgann Kane, "Armored Dinos" employs the cheapest techniques of natural history filmmaking. The sound track is almost wall-to-wall male voice over (delivered by Nick Schatzki), interrupted only by a few interviews with scientists. The film's production company, Wall to Wall Television, must not be in on the joke, as our program's critique of such wall-to-

wall voice-over narration is savage and relentless. Conversely, the film's visual imagery consists mostly of very cheaply produced animations (by the Dinamation International Corporation), many of which are lifted from the Encyclopedia Britannica, of all places!

The opening voice-over sets the tone for the entire half-hour show: "A hundred million years ago, the law of the jungle was kill or be killed. Combat was fierce, the outcome usually fatal. To level the playing field, dinosaurs staged the longest-running arms race in history, and produced some of the weirdest defenses ever invented." The film thus hits quick and hard with its attempt to render a static and boring science, paleontology, as filled with excitement, action, and violence. The dinosaurs are attributed agency, needing to "level the playing field" and staging an arms race. This voice-over analysis is used over the credit sequence, which consists of roving camerawork across still photos of dinosaur models from museums, as well as images of paleontologists working out in the field. On the soundtrack, the voice-over narrator is mixed with sound effects of roaring dinosaurs, and exciting music dominated by horns and a strong drum beat.

The entire *PaleoWorld* series suffers from this hyperkinetic presentation of the dinosaurs as violent and their fate apocalyptic. In the episode, "Are Rhinos Dinos?" (again, filmed in 1996; the episode I studied aired April 24, 2002 on the Science Channel), the endangerment of the rhinoceros at the hands of poaching humans is naturalized via a study of the extinction fates of the animals' related dinosaur ancestors. The episode, "Horns and Herds," about triceratops (also 1996, studied from a tape of an April 24, 2002 airing) begins with apocalyptic voice-over hyperbole: "In an ancient riverbed, a catastrophe is frozen in stone. Here lie the bones of hundreds of animals slain by an unknown killer. But out of this disaster have come extraordinary details of the life of one of the best loved dinosaurs ever to have walked the Earth."

However, I choose to analyze the "Armored Dinos" episode because it pushes *PaleoWorld*'s absurd use of apocalyptic metaphors to its furthest, nuclear extreme. The first image of the episode

offers a direct military metaphor: a tank crosses rugged terrain, and then a cut to more still images of dinosaurs. The narrator explains this bizarre juxtaposition:

> In battle, a modern tank requires armor for protection, speed to avoid capture, and firepower to destroy the enemy. The same was true millions of years ago, when the world's first tank appeared, in the form of a dinosaur. Called Thyreophora, the shield bearers, they were literally encased in armor. This docile plant eater with knobs of bone on its head and back, confounded a horde of predators, neutralized an arsenal of awesome weapons, and launched an arms race without parallel in modern history.

The narration is delivered with a camera zooming across cartoon stills of dinosaurs, familiar to anyone who has read the Encyclopedia Britannica. The linking of dinosaurs to human weaponry becomes the dominant motif of the show. The minimalism of the images stands in contrast to the over-determination of the script. Of course, the dinosaur is not *literally* encased in armor, but the show needs to seal the connection between past and present, not as metaphor, but as a viable mode of analysis.

The show then shifts to a battle between a Stegosaurus and an Allosaurus. Lest we come to believe that the military metaphor is merely the invention of the filmmakers, the show uses its first interview segment to justify its scientific accuracy. Seated in a tank, paleontologist Bob Bakker tells us: "Now this tank works as a fighting vehicle because it can turn around, real fast. Stegosaurus worked as a Jurassic fighting vehicle, 'cause it could turn around." The voice-over narrator then immediately extends the material from the scientist, focusing on the "prize-winning deltoids" of the Stegosaurus who also possessed "a secret weapon, a tail that whipped with a vicious four-pronged spike." The images associated with this insight are more dinosaur cartoons, in this case, an animation of Stegosaurus using his tail as a weapon. Again, the narrator denies the metaphoric nature of the military associations: "When the predator approached, Stegosaurus literally swung into action, swinging its tail like a primeval swordsman."

After the first commercial break, the show returns us to one hundred million years ago, in what is now Colorado, the location of the "primeval swordsman's" "tragic duel." In 1992, Ken Carpenter of the Denver Museum of Natural History found the remains of a female Stegosaurus. Here, we watch footage

of paleontologists excavating dinosaur bones. Carpenter's theory, that the Stegosaurus bones were living tissue, not solid bone, allows the show to make an appeal to the conventions of the "blue chip" wildlife film. The narrator tells us, "Ken thinks Stegosaurus might have used its plates like an elephant uses its ears," which prompts stock footage of elephants using their ears for cooling. The narrator ends this segment with his insistent return to the metaphor of the arms race:

> Clearly, this blushing brute was no docile plant-eater, but a cleverly designed war machine capable of attack as well as defense. But victory demanded innovation. Over time, opposition stiffened. Predators got bigger, faster and better equipped. As the Jurassic gave way to the Cretaceous 135 million years ago, weapons and tactics were being refined. The arms race was heating up.

The film thus becomes a history of the dinosaur in which each period serves to naturalize the arms race between its different violent species.

After the second commercial break, the show finds its most over-determined nuclearist segment. At eastern Utah's Cedar Mountain in 1992, two amateur fossil hunters use a Geiger counter to find dinosaur remains. The narrator tells us: "Taking a lesson from nuclear physics, Ray and Carol Jones exploited a discovery made during World War II. Where there were dinosaurs, there was radioactive uranium." The images that accompany this story include workers mining uranium and the stock image of an atomic bomb blast! The show thus finds the nuclear relevance of the dinosaurs not only in metaphors for animal behavior in the geological past, but in the very present methods for acquiring that knowledge. Nuclear culture is thus naturalized at all moments in Earth's history, both past and present.

The film links this method to respected science, in this case an interview with paleontologist Don Burge, who uses the Jones' technique to unearth yet more dinosaur fossils. Burge again uses reference to current natural history to explain his "armored" Nodasaur: "I think it's an amazing animal. Some of the armor [features] big spikes and so on. Maybe like a porcupine." While Burge is interested in the relationship between porcupine and Nodasaur armor, the narrator presses onward toward the film's nuclear climax: "However impressive, Nodasaurs were still primitive. Battle lines were being drawn for the final showdown in the dinosaur arms race."

To do so, the film presents its final interview with Jim Kirkland of the Dinamation International Society at Utah's Gaston Dinosaur Quarry. In 1991, Kirkland found "a claw twice as big as any he had ever seen, a foot long, sharp enough to shave with." The animal, dubbed the Utah Raptor, serves not only as the villain in *Jurassic Park* (Steven Spielberg, 1993), but also this film's most intriguing engagement with nuclear culture. The narrator enthuses: "Kirkland had found a super predator. The largest of its kind. A genuine terminator." Thus, *The Terminator* (James Cameron, 1984) comes to serve as the film's intertextual reference to Hollywood culture, not so much the more obvious *Jurassic Park*. References to Arnold Schwarzenegger as the terminator, both as a Hollywood box office draw and a politician, indicate the broad fashion in which nuclear referents penetrate American culture. Schwarzenegger's character in Cameron's film serves as a return of the repressed, a machine sent back into the past to ensure that mankind's nuclear immolation takes place as planned.

However, the Utah Raptor version of the terminator, as in a Hollywood movie, has a worthy competitor in the narrative of this episode of *PaleoWorld*. For, the film tells us, Kirkland discovered the remains of a plant-eating dinosaur, Gastonia, right next to the Utah Raptor. Gastonia was "a new concept in heavy armor, a tank, with attitude," the narrator informs us. Here, the film produces its nuclear climax. The narrator explains: "Kirkland found the ultimate predator and the consummate defender lying side by side. The stage was set for the terrifying climax of the dinosaur arms race." The narrator presents the showdown as a Hollywood Western: "High noon, 100 million years ago." With a mix of still images from the encyclopedia, animated cartoons, and the cheesiest shot in the film, of a child's die-cast plastic toy model of the dinosaurs, the film re-enacts the fight. {LINK CLIP #2 HERE: Caption: "*Paleoworld*: The Jurassic Cold War." Copyright: Wall to Wall Television, 1996}

The film's final voice-over narration demonstrates the ideological message of the film, and the reason I find this otherwise awful film so important. The narrator naturalizes human behavior by explaining the dinosaurs as Cold War combatants. In the most chilling moment of any nuclear film that I know of, the narrator theorizes:

The arms race had reached its climax. By the time the dinosaurs became extinct, the super killers and their armored enemies had achieved parity. Faced with the prospect of mutual annihilation, they withdrew from the brink of destruction. For the most advanced warrior dinosaurs, a balance of terror had been struck, and hostilities ceased. After 75 million years, nature had intervened, putting an end to the longest-running arms race in history.

The film thus concludes by implying that the late Twentieth Century's insanity, the development and deployment of nuclear weapons, was a perfectly logical event, since millions of years ago, dinosaurs engaged, willfully and deliberately, in just such viciousness. The Raptor and Gastonia in the past, just as the United States and the Soviet Union in the present, had "achieved parity." These ancient animals, about whom we know almost nothing, are presented as intelligent, just as we contemporary humans are, for withdrawing "from the brink of destruction." Our human survival during the Twentieth Century is not seen as a lucky accident, which it clearly was, but instead as the result of the intervention of "nature," as if some Gaia-like magical force ensures the continued success of life on the planet, despite animals' and humans' "natural" proclivities for violence.

I have engaged in an extended analysis of the *PaleoWorld* episode, but not because I believe it is an industrially important film for understanding the success of the Discovery Channel. My family and I watch the Discovery networks religiously and I have never seen, thankfully, "Armored Dinos" re-broadcast. Instead, the importance of the show for me lies in its status as the extreme limit case of how nuclearism penetrates our mediated consciousness. As my concluding example, I want to assess how the nuclear metaphors of "Armored Dinos" find their way into even the most banal of "blue chip" natural history films about wildlife. *Lion Battlefield* presents the story of two brother lions on the African plain. The film engages in the general militarist metaphors that we saw in "Armored Dinos." One brother goes on "border patrol." At one point the film celebrates the new, and much lamentable, if one believes in the importance of the freedom of the press, embedding of reporters into military units to control information: "You are now on patrol with possibly the greatest animal defense force on earth." Jackals and hyenas are introduced as the "first wave of ground troops." Vultures are "the savannah's scavenging elite [who] arrive by air," later referred to as the "vulture task force."

The film extends beyond these military metaphors toward nuclearism: the savannah is governed by nuclear détente. The voice-over narrator, again male and authoritative, tells us: "Every pride male knows exactly where the others are. . . a good way of avoiding volatile face to face encounters." However, it is the film's use of CGI techniques—to give us views and events that conventional natural history filmmaking cannot capture—that proves most damaging to nuclear criticism's belief that we can liberate ourselves from the devastations of nuclear culture's contamination. As one of the lion brothers roars, he emits a visible circle of sound which emanates from his mouth, across the savannah, striking the other lions in the region. The film's point is that the lion roars in order to protect his turf from intruding nomads. However, to produce this scientific tidbit visually, the film engages a visual cliché from our nuclear past. This image of the shock wave is familiar to us from countless test films and their Hollywood re-creations.

The filmic experiment of *Lion Battlefield* lies in its use of CGI images to enhance our experience with the real lives of lions. However, the retreat from hard to capture wildlife footage (already contaminated by the ideological mechanisms of the cinema itself), results in a devastatingly ideological portrait of the African plain. By choosing the nuclear shock wave as the metaphor for a lion's roar, the filmmakers have unwittingly developed the most conservative reading of our atomic predicament. Since lions' voices engage in nuclear warfare, this metaphor implies, then it is perfectly natural that humans would do so as well. For those of us drawn to the powerful tools of nuclear criticism, nothing could be further from the truth. The tragedy of the Twentieth Century is the development of such weapons; humanity's redemption lies in their repudiation. Lions are neither interested in, nor capable of, the destruction of the planet. Thus, it is only humans, not animals, who must make the choice to repudiate their nuclearism. {LINK CLIP #3 HERE: Caption: "*Lion Battlefield:* The lion's nuclear roar." Copyright: BBC/Discovery, 2002}.

My pedagogical stance with the M.F.A. students is to teach the tools of critical theory so that the next generation of natural history filmmakers do not use such metaphors unthinkingly. It is not at all

intuitive to begin teaching nuclear criticism to students who want to make films about lions. I knew that this was an important project, but not for the reasons I am ultimately arguing now. My initial assumption was that nuclear criticism is one of the obvious places where critical theory meets science and technology studies. However, the expansion of this inquiry into the very heart of blue chip wildlife filmmaking indicates that the assumptions of nuclear criticism are more accurate and incisive that even its proponents realize. Lifton and Mitchell argue that, "Hidden from the beginning, Hiroshima quickly disappeared into the depths of American awareness" and, citing Mary McCarthy, that it quickly became "a hole in human history."[xi] The discovery that I made about the contamination of natural history filmmaking with nuclear metaphors indicates that it is desperately important for us to fill in this hole with the illumination of analysis and criticism. For my students, the next charge remains, building an understanding of the animal world that is not subservient to the callow ends of naturalizing human barbarity.

I intend this essay to intervene into methods deployed for the study of documentary. While recent work has applied cultural studies approaches to similar nuclear events—for example, Mark Williams' fascinating study of local television coverage of atomic tests in the 1950s—much documentary film study does not mention the Hiroshima event directly. The major theorists of film documentary—for example, Bill Nichols in *Representing Reality* or Michael Renov in *Theorizing Documentary*—treat documentary's representation of the Real via other historical events.[xii] The major scholar of the documentary to treat Hiroshima in detail is Erik Barnouw, who, in the 1970s while at Columbia University was instrumental in packaging the footage shot by Japanese cameramen at Ground Zero in 1945.[xiii] That footage, previously censored by the U.S. government, was packaged by Barnouw as a short film, *Hiroshima-Nagasaki, August 1945* (1970).

Furthermore, throughout his seminal history of documentary film, Barnouw analyzes in detail the direct documentary engagements with Hiroshima. In his section, "Prosecutor," Barnouw links post-war films about Nazi concentration camps, such as Alain Resnais' seminal *Night and Fog* (1955), to the

footage shot at Hiroshima and Nagasaki. While Barnouw seems to mimic Lifton and Mitchell when he argues, "the atomic holocaust haunted men's minds," he maintains a traditionalist definition of how to identify what the non-fiction film is documenting.[xiv] My project, instead, has tried to show that a natural history film, intending to document the lives of animals, might instead work at an allegorical level to reveal not *that* the atomic holocaust haunted men's minds, but instead *how* it did so. That is to say, just because non-fiction films work by capturing the pro-filmic event does not mean that the study of such films must ignore allegorical reading methods developed for narrative cinema.

Furthermore, this project deploys the interdisciplinary methods of nuclear criticism within a pedagogical program designed to question the departmental separation of "the two cultures." That divide, between scientists and humanists as described by C.P. Snow in 1959, remains one of the most annoyingly persistent barriers in the contemporary academy. By triangulating filmmaking, critical theory, and science, it may finally be possible to unify those cultures, appropriately, to form a consensus location from which the centralization of nuclear metaphors is exposed for what it truly is, the lunacy about which Carl Sagan warned twenty-five years ago. As it stands now, the filmmakers who make *Lion Battlefield* and *Paleoworld* stubbornly exist outside of the critical conversation prominent in the humanities academy. However, with a new generation of critically-trained filmmakers, this woeful situation need not continue in perpetuity.

Filmography

The Beast from 20,000 Fathoms (Eugene Lourie, 1953)

Beneath the Planet of the Apes (Ted Post, 1970)

Connections (Mick Jackson, 1979)

Cosmos (Adrian Malone, 1980)

The Day After Trinity (Jon Else, 1981)

Hiroshima-Nagasaki, August 1945 (Erik Barnouw, 1970)

Jurassic Park (Steven Spielberg, 1993)

Kiss Me Deadly (Robert Aldrich, 1955)

Lion Battlefield (BBC/Discovery, 2003)

PaleoWorld (Discovery, "Armored Dinos," 1996)

PaleoWorld (Discovery, "Horns and Herds," 1996)

PaleoWorld (Discovery, "Are Rhinos Dinos?," 1996)

The Terminator (James Cameron, 1984)

Watch Mr. Wizard ("The Hydrogen Bomb," 1955)

Endnotes:

[i] Alexander Hammond, "Rescripting the Nuclear Threat in 1953: *The Beast From 20,000 Fathoms*," *Northwest Review* 22.1-2 (1984), pp. 181-194.

[ii] Mark Osteen, "The Big Secret: Film Noir and Nuclear Fear," *Journal of Popular Film and Television* 22.2 (Summer 1994), pp. 79-90.

[iii] Robert Jay Lifton and Greg Mitchell, *Hiroshima in America: Fifty Years of Denial*, New York: Putnam, 1995, p. xi.

[iv] Lifton and Mitchell, *Hiroshima in America*, p. xvi.

[v] C.P. Snow, *The Two Cultures*, Cambridge: Cambridge UP, 1998.

[vi] Jacques Derrida, "No Apocalypse, Not Now (full speed ahead, seven missiles, seven missives)," *Diacritics* 14.2 (Summer 1984), pp. 20-32.

[vii] Derrida, "No Apocalypse," p. 26.

[viii] Carol Cohn, "Nuclear Language and How We Learned to Pat the Bomb." *Feminism and Science*, ed. Evelyn Fox Keller and Helen Longino, Oxford: Oxford UP, 1996. p. 176.

[ix] Carl Sagan, "Antiscience," *The Demon-Haunted World: Science as a Candle in the Dark*, New York: Ballantine, 1996, pp. 245-263.

[x] Evelyn Fox Keller, "From Secrets of Life to Secrets of Death," *Secrets of Life/Secrets of Death: Essays on Language, Gender, and Science*, New York and London: Routledge, 1992, pp. 39-55.

[xi] Lifton and Mitchell, *Hiroshima in America*, p. xv.

[xii] Mark Williams, "History in a Flash: Notes on the Myth of TV 'Liveness'," *Collecting Visible Evidence*, eds. Jane M. Gaines and Michael Renov, Minneapolis and London: Minnesota UP, 1999, pp. 292-312.

[xiii] Erik Barnouw, *Documentary: A History of the Non-Fiction Film*, 2nd rev. ed, New York and Oxford: Oxford UP, 1993.

[xiv] Barnouw, *Documentary*, p. 179.