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Reflections on *Whole World on Fire*

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My remarks are divided into my personal and my sociological reflections on *Whole World on Fire* (Eden, 2004).

As an aging baby boomer – to use that awful cliché – it is hard to read *Whole World on Fire* without at the same time thinking about my childhood experiences growing up 'under the shadow of the mushroom cloud'. I was too young to understand McCarthyism, but my memories of the atom bomb zeitgeist are very vivid. Until I was 12 years old, we lived in Burbank, California, home at that time to Lockheed Aircraft and, as I was often told, ground zero. I remember how Mrs Dodge, my fourth grade teacher, would be teaching us carrying or borrowing, when she would suddenly shout 'Drop!', and we would scramble under our seats, covering our eyes to protect us against the blinding flash of light. Later I learned that these drills prepared us for a sudden attack, when we would have less than 5 minutes. I remember my next-door neighbor, Marsha, taking me and another friend into the bomb shelter, which was a dirt trench, about 8 feet high, that her father had dug under the house. I can still remember being so scared during the Cuban Missile Crisis that I went to bed in my tennis shoes, just in case I would have to make a run for the neighbor's shelter in the middle of the night. My mother reassured me we were in no danger, so I was shocked to find her formerly empty pantry stocked with canned goods. After we moved to a nearby suburb, I remember how impressed my friends and I were when the neighbor who owned the biggest lot built a house, a pool, and a bomb shelter. Of course, these are the memories of a child, but they do reflect the views of adults that a nuclear attack was very likely, that most people would perish, and that we should do everything we could to be among the small number of people who would survive. Years passed and some time, maybe in the 1970s and 80s, we laughed at the bomb shelters that would do no good, since we had stopped believing in a survivable nuclear war. If you were lucky enough to be born in Montana, the fallout would kill you and ultimately the world would be covered by a black dust cloud, and we would go the way of the dinosaurs. No one in their right mind – not even Ronald Reagan – believed in a survivable nuclear war. Or so I thought before reading *Whole World on Fire*.

At one level, *Whole World on Fire* tells the story of how organizational processes led nuclear scientists to drastically underestimate the damage of

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a nuclear attack. At a deeper level, it is a study in the social construction of organizational knowledge.

The book asks why US efforts to predict the damage of a nuclear attack focused almost exclusively on damage from the explosion while ignoring the far more damaging effect of mass fires, thereby failing to recognize the extent of devastation a nuclear bomb could produce. This is not a trivial question, for the more likely military scientists are to underestimate the damage of a nuclear bomb, the more likely they are to think more bombs are necessary, and the more likely they are to use them.

To answer this question, Eden brings together two traditions: science and technology studies and the sociology of organizations. She uses three key concepts: organizational routines, path dependence, and, most important, organizational frames, which she defines as assumptions about the kind of problems that should be investigated and the range of possible solutions. The concept of organizational frames, which is borrowed from Bijker's (1995) concept of technological frames in his study of bakelite and ultimately traceable to Goffman (1974), captures the tendency of organizations to accept some kinds of information as accurate while invalidating others.

Basing her arguments on archival research, oral histories, and interviews with key informants, Eden provides a sociological account of more than 50 years of military research. Between 1945 and 1995, the US spent millions on research undertaken to estimate the results of nuclear attacks. To simplify a more complicated argument: during World War II, the US military planned attacks according to the frame of precision bombing – or blowing up strategic targets rather than bombing an entire city. After Hiroshima and Nagasaki, military researchers assimilated nuclear warheads to this model. This led them to focus their research efforts almost exclusively on predicting the effects of the explosions rather than on the much more devastating fire that followed. At the same time, scientists showed little interest in investigating the potential effects of mass fires because of the deeply entrenched belief that it was impossible to develop models to predict fire damage, thought to be affected by fluctuating weather conditions. Because damage from mass fire was outside the precision bombing frame, scientists devoted very few resources to investigating this even more deadly phenomenon. Thus the belief that fire damage was unpredictable became a self-fulfilling prophecy. Moreover, the researchers who did study fire were foresters and engineers outside universities who lacked contact with physicists or the computers necessary to develop complex models. This less influential group also concluded that fire damage was not predictable – a belief that held sway until nuclear weapons physicist Harold Brode demonstrated in the 1980s that it was possible to predict damage from mass fire. Brode's fire research has remained controversial and was de-funded after the Cold War. Even today, fire damage is not factored into calculations of nuclear damage.

Before discussing how outstanding the book is, I want to discuss what might provoke the most controversy in science and technology studies: the

fact that Eden takes a position on a scientific controversy about the predictability of fire damage and comments on scientists' assessments of risk. Eden had a much more daunting task than, for example, Diane Vaughan in her *Challenger Launch Decision* (1996). Vaughan began with a disaster that had already occurred and, with the benefit of hindsight, went on to develop a *post hoc* explanation of what had gone wrong. For the millions of Americans who watched the *Challenger* explode in mid-air, it was beyond dispute that mistakes had been made. Fortunately, a recent nuclear disaster has not occurred, so Eden did not have 'proof' that scientists had underestimated the effects of a nuclear attack. To make her argument, Eden was forced to take a position on an actual scientific controversy about the predictability of fire damage and to evaluate scientists' assessments of risk.

In taking this position, Eden ran the risk of encountering criticism from both members of the military scientific establishment and some of those who study science and technology. On the one hand, by taking sides in a controversy on the degree of damage produced by nuclear weapons, and, in particular, by endorsing a position held by only a minority of nuclear scientists, Eden risked widespread criticism from most 'experts' in the field. On the other hand, she also risked criticism from the large number of social scientists who study medicine or science and who prefer to leave arguments about the 'science' to the scientists. By taking a stand on the 'science', Eden ventured forth where other sociologists fear to tread.

There are three main objections to taking a stand on 'science'. A first is that as sociologists we are simply not qualified to take a position on scientific or medical issues, and we should therefore avoid poaching on scientific turf. In my own research, for example, I sometimes encountered two patients with similar diagnoses who received very different treatments, presumably because physicians were affected by different social characteristics of each patient. Yet, when I questioned doctors as to why two ostensibly similar patients had been treated differently, they usually were able to justify their decisions by pointing to medical differences between the two cases. Because I did not feel qualified to question physicians' medical judgment, I was forced to accept their accounts at face value. The problem with the view that we are not qualified to render medical or scientific opinions is that it uncritically accepts rigid disciplinary boundaries and claims to expertise.

The second argument against evaluating 'science' is that we should not have the same goals as those we study – in this case, rendering judgments about the scientific merits of predictions of damage from nuclear warheads. If, according to the first argument, as social scientists we are insufficiently qualified to render scientific judgments, according to the second view, our role is not to appropriate the discourse of practitioners but rather to explicate it. Both arguments entail considerable boundary work, insofar as they draw strict lines of demarcation between researcher and researched (Gieryn, 1983). This position has many justifications, but I will mention two of them. If sociologists engage in the same discursive

practices as the professionals/scientists they study, the argument goes, they risk losing their specific warrant for studying scientific communities. As Jack Katz (2001 [1997]: 370) notes, 'if the [sociologist] takes as data the special knowledge that the subject group claims, then on what basis can the [sociologist] claim to understand more than experienced practitioners already know?' Why should anyone want to read a sociologist's discussion of scientific research when they can open a scientific journal and read 'the real thing'? This argument is powerful, but suffice it to say that the analytic core in *Whole World on Fire* is about organizational frames – an analysis a scientist would be unlikely to undertake. The second justification for avoiding judgments about scientific merit is that of 'ethnomethodological indifference', or 'seeking to describe members' accounts of formal structures ... while abstaining from all judgments of their adequacy, value, importance ... or consequentiality' (Garfinkel & Sacks, 1970: 345). Thus an ethnomethodological study would present without evaluation a detailed description of scientists' practices, including how they decide whether fire damage is 'predictable', assess risk and the potential damage of nuclear warheads, and dispute (or ignore) competing arguments. To be sure, *Whole World on Fire* is not ethnomethodological. But its value, as I will discuss, lies elsewhere.

The third argument is epistemological. According to Steve Woolgar and Dorothy Pawluch (1985), to claim that science is constructed through organizational frames, while at the same time arguing that some scientists are 'correct' or 'incorrect' is to be inconsistent, or to commit 'ontological gerrymandering'. It is not entirely clear, even to Woolgar and Pawluch, that it is even possible to produce a sociological account that is completely free of ontological gerrymandering. To remain relatively consistent, Eden would have had to present two competing frames about nuclear damage without evaluating either one of them. But – and in this case at least I agree with Joel Best (1993) – consistency opens some vistas but forecloses others. To wit: it can preclude asking interesting and important questions about the 'misconstruction' of scientific arguments, placing Copernicus and the Flat Earth Society on an equal footing. There is no doubt that, ideally, researchers should follow through on the epistemic commitments they have made. Epistemological consistency is, *ceteris paribus*, a desideratum. However, I view it as a relative good, to be balanced against other considerations. Thus in the case of arguments about nuclear warfare, there are powerful ethical and sociological considerations that are more important than consistency. When the topic is as socially consequential as the one Eden studied, it is arguably ethically problematic and sociologically disingenuous to refrain from taking sides when the researcher has reason to believe that one side is correct. When engaged in work that has even a small potential to affect nuclear policies, it might less valuable, to paraphrase Best (1993), to ask how we know, what we know, and, more valuable to ask, what – if anything – we know about the phenomenon under study. To summarize: in taking a stand on a controversy in science, Eden, I believe, showed enormous intellectual daring.

Having discussed the book's most provocative argument, let me say something about its other virtues that are less controversial. To my knowledge, there have been few sociological studies that have penetrated the inner workings of the military establishment. More than three decades have passed since Laura Nader exhorted social scientists to 'study up' – that is, to study 'the colonizers rather than the colonized, the culture of power rather than the culture of the powerless, the culture of affluence rather than the culture of poverty' (Nader, 1969: 289). During this period, relatively few sociologists have ventured into the upper reaches of the social structure. In fact, those of us who study science and medicine usually do our research in university-based laboratories or teaching hospitals – that is, we study people who are in some senses like ourselves. In short, Eden's book is one of the few STS studies that successfully fulfills Nader's mandate.

Before concluding, the reviewer is expected to enumerate the book's shortcomings. However, I find the book's 'flaws' to be quite trivial. Readers who want a book that challenges sociological theory or gives us a new set of concepts to understand old phenomena should not read *Whole World on Fire*. Ultimately, the book's contribution is not to invent a theory *de novo*, but rather to use existing theory and concepts to enable us see a phenomenon in a new light.

Even on my second reading. I remain convinced that Eden's *Whole World on Fire* is a remarkable achievement. I found the story Eden tells to be chilling. Her account of the firestorm in Chapter 1 was riveting. Perhaps I am naive, but I thought that by now everyone believed that survivable nuclear war is an oxymoron, that people had filled in their bomb shelters long before the close of the Cold War. The fact that a significant portion of the military establishment still believes that a limited, winnable, and survivable nuclear war is possible gave me nightmares.

Although the topic of the book is important in its own right, the conclusion shows how the concept of organizational frames can illuminate other disasters resulting from the 'misconstruction' of scientific knowledge, from the *Titanic* to the collapse of the Twin Towers. But what convinced me of the book's power was the article describing the findings of the committee investigating the Iraq War that appeared last year in the *New York Times* around the time I read *Whole World on Fire*. The Committee's report detailed how the CIA had systematically denied the credibility of numerous reports that Iraq's weapons of mass destruction did not exist, reports that were outside its organizational frame. In short, *Whole World on Fire* is an exemplar of how sociological concepts can illuminate an important public issue.

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