



## ATOMIC HERITAGE FOUNDATION

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This is the full transcript from the workshop hosted by the Atomic Heritage Foundation, “Transforming the Relationship between Science and Society: Interpreting the Manhattan Project” on February 14-15, 2013. The workshop was funded by the National Science Foundation's Informal Science Education program in the Directorate for Education and Human Resources (EHR) and the Science, Technology and Society Program in the Directorate for Social, Behavioral and Economic Sciences (SBE).

The workshop considered recent scholarship about the Manhattan Project and determine how the issues of science and society raised by the development of the atomic bomb can inform and be integrated with contemporary issues. The workshop's goals were to advance the inter-disciplinary scholarship and to generate a set of ideas and recommendations for the development of exhibits, programs and media about this topic and its relevance to the 21st Century. The participants grappled with the challenges that arise when presenting issues raised by science in the context of history, society and culture.

Please note that because of the length of the transcript, we have not attempted to identify every speaker, nor have we attempted to closely edit the entire transcript. We have left the timecodes in the transcript, but as we have edited the videos, the timecodes do not always correspond to the videos on YouTube.

To view videos of the presentations and some of the discussion sections, please visit our YouTube page's playlist [AHF Workshop: Interpreting the Manhattan Project](#).

### **Introduction**

Cynthia Kelly: Good Morning. Welcome to the Atomic Heritage Foundation's new offices. We are very grateful to the law firm of Latham & Watkins where my husband worked for twenty-five years, but that was over ten years ago he left. And it just continues to be very gracious in letting us use their facilities, which are incredibly high tech and gorgeous. They are recording this session. There are people in Los Angeles who are peering in on our conference, but soon we will have the ability to put all, or parts of this, online, which is great. Our idea is that we would at least have the excerpts of the presentations available. We'll try to transcribe the entire proceedings, and then have a report that will be a synthesis of this. But it will be very helpful to make sure we don't lose any morsel of good ideas that are contributed in this.

I should start by thanking all of you for coming. We are so delighted to have such a distinguished group of humanitarians, scholars, authors, and museum experts that I think will be the best team to try to tackle this issue of how to present to the public the transforming power of science on society in all sorts of predictable and unpredictable ways. Using the Manhattan Project as a case study, which I think is of course, dear to the hearts of many here whose museums are dedicated to interpreting the Manhattan Project and to the Atomic Heritage Foundation, which is dedicated to preserving this history and trying to get a Manhattan Project National Historical Park.

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I should probably let everybody know how excited we are that the Congress that kind of ran out of time and energy, as you might have noticed last fall and left our park legislation hanging, has gotten renewed vim and vigor. The Senate Committee is looking to try to get the bills that were left over last year, the top picks, and we are sure we're one of them, moving forward as early as this spring, March or April. So we're very excited.

Senator Ron Wyden of [00:03:00] Oregon has taken over the chairmanship of the committee, and he is going to be visiting the B Reactor, which is our iconic reactor in Hanford in a couple of days. And as Heather just said, "If you want to see the B Reactor, you have to fall in love with it." So we're sure that legislation will be forthcoming, which just makes this conference even more timing.

I also want to recognize that we're very fortunate today that we have several representatives from the National Park Service, both here today at the session, and coming this evening to talk to us about the challenges they face, and then how we might collaborate and work together. We also have a representative of the Department of Energy, because they're our partners in this.

What I'd like to do is to just take a minute and let each of you identify yourselves briefly. My job today is trying to keep the folks on schedule. It's a difficult position, because I'd love to take each topic and let it play out until the end, but that might be several weeks from now when we finally exhaust each of these topics. So you'll think I sort of know nothing by saying, "No. That's enough on that," because I know these are hugely complex and maybe even delicious topics to discuss. But we're just going to have to be a sampler. Try to distil the top ideas and we'll have to continue the conversation in the future.

Robert Norris: Hi. I'm Robert Norris, and I'm a biographer of General Leslie Groves. The name of the book is *Racing for the Bomb*. I'm also on the Atomic Heritage Foundation and Advisory Board, and currently a fellow at the Federation of American Scientists.

Cameron Reed: Good morning. I'm Cameron Reed. I'm a physics professor at Alma College in Michigan, a small liberal arts college. My sort of research area is a physics and history project, and I'm currently working on a textbook covering a science and history project to be published I hope later this year.

Kirsten Buchner: Hi. My name is Kirsten Buchner and I'm here to document the proceedings. I'm the workshop evaluator. So I will be observing everyone's participation, and maybe I'll chime in if it seems prudent. Then afterwards I will be asking you [00:06:00] for your feedback regarding what you thought took place here.

Moderator: Just make sure the people who will be trying to transcribe this can hear. These are little mics right before you. Alex, whom you'll meet in a minute, has control to turn them all on. If you're a presenter, she'll have everybody else's off, except for the three presenters who will sit here. We're going to do a little musical chairs, because the camera can focus in on the presenters. You can see our picture up there. That's the whole room where you can see there are people here, but you really can't tell what color tie he has on and that kind of thing. So we'll have the camera zoom in on the presenters when they're presenting, and only their mics will be on. During the discussion, you really need to lean forward and make sure your voice is clearly recorded.

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Kirsten Buchner: And please make sure the tech cards are not covering the microphones.

Moderator: Right, that is a problem. Find your mic. Okay, go ahead Alex.

Alex Wellerstein: I'm Alex Wellerstein. I'm an historian of science. I'm at the Center for History and Physics at the American Institute of Physics. I work on the history of nuclear secrecy. I have a book eventually coming out, and I have a blog at [www.nuclearsecrecy.com](http://www.nuclearsecrecy.com).

Linda Deck: Hi everyone. I'm Linda Deck. I'm the Director of the Bradbury Science Museum at Los Alamos National Laboratory. I've been a museum professional for over thirty years now with a lifelong interest in Informal Science Learning, and how to engage users in science learning, not just visitors or observers. They have to be users.

Kelly Moore: I'm Kelly Moore. I'm a Sociologist of Science at Lorelei University in Chicago. I am here to talk in part about conceptions of social responsibility among scientists in the postwar period, based in part on the book that I published in 2008 called *Disrupting Science*. It's about scientists in the military in the postwar period.

Angela Creager: Hi. I'm Angela Creager. I'm the Historian of Science. I teach at Princeton. My focus is on postwar biology and medicine, and I have a book that's in press coming out this fall that looks at the history of radioisotopes and especially their connection to the Manhattan Project and the new technology that were developed with the bomb.

Alex Levy: Hi. I'm Alex Levy. I've been the Program Manager at H-Net for a year now. If you have any questions ask me.

Carla Borden: I'm Carla Borden, a writer and editor. I've spent thirty-five years at the Smithsonian, and I'm planning to turn these discussions into a cogent and inspiring report. [00:09:00]

Alan Friedman: Good morning. I'm Alan Friedman. I'm a physicist who wandered into a science museum in 1972 and never came out. My area is how to communicate through the medium of museums and science centers. And almost as far back I also was coauthor of a book called *Einstein as Myth and Muse*, which had one chapter on the relationship between Einstein and the bomb, both the real and the supposed much celebrated in fiction, and unfortunately quite a lot of what claims to be nonfiction.

Al DeSena: Good morning. I'm Al DeSena. I walked into a science museum in 1979 and didn't come out until eight years ago. And now I'm the Program Director at the National Science Foundation, and the Education Directorate in particular, in the program that focuses on funding projects that have to do with helping the public understand science. And you'll hear more about our collaboration with other social, behavioral, and economic sciences on record.

James Speed: Good morning. My name is James Speed. I'm the Edward Teller fellow at the Department of Energy. I'm a PhD candidate at UC Berkeley. My research is a little bit different, although related from most of what you all do. I work on the influence of the sciences on the business practices of the mass engineering industry after World War II.

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**Bud Rock:** My name is Bud Rock. I walk into a lot of science centers and museums. I'm the CEO of the Association of Science-Technology Centers, and we have about six hundred and thirty-five institutions in forty-seven countries around the world. I came to this position after thirty years in the U.S. Department of State, and retired as the Assistant Secretary of the Bureau that's responsible for science and technology cooperation, among other global issues.

**Larry Lee:** Good morning all. I'm kind of the ringer. I had a late invitation to this. My name is Larry Lee. I am an engineer and technology historian with the Historic American Engineering Record of the Park Service. I was one of the authors of that report that was done last year concerning K-25, with a long time involvement in things nuclear, and a variety of other things too. Obviously I've a keen interest in the hopeful park, as well as the ideas there about how in a park setting the whole thing is to be interpreted, not just from the project in general, but also what it was like working in the particular facilities [00:12:00]. So thank you Cindy for the invitation.

**Cindy:** You're very welcome. Glad to have you.

**Mac West:** I'm Mac West. I'm a consultant. My Company is Informal Learning Experiences. ILE institutionalized myself twenty-two years ago after a career as a Curator and Museum Director. In that intervening time while I'd been a consultant, I had the opportunity to do a couple of projects in Oak Ridge, which truly opened my eyes to both the science and some of the sociological aspects of the Manhattan Project. And then I've also done a project in suburban Denver on Rocky Flaps, which is a part of the post Manhattan project nuclear business. So I'm bringing both museum experience and onsite experience at two very significant sites.

**Fred Kronz:** I'm Fred Kronz. I'm a Program Director at the National Science Foundation. My Program is Science, Technology, and Society. We fund social studies science and history science and philosophy of science projects, with particular emphasis on the interface between science engineering and technology in one hand, and society in the other.

**Heather McClenahan:** I'm Heather McClenahan, the Executive Director of the Historical Society in Los Alamos. I like to say the museum tells the science story and we tell the people story. We also have an extensive archive that I think many of you have researched in. And thanks to the help of Cindy, the owners of the Oppenheimer House, which will be open to the public sometime in the future.

**Ken Mays:** I'm Ken Mays, Deputy Director of the American Museum of Science & Energy in Oak Ridge, Tennessee.

**Andrew Brown:** I'm Andrew Brown. I think I'm still a Research Associate at the Belfer Center at the Kennedy School. I've written biographies of several twentieth century scientists, two of whom, James Chadwick and Joseph Rotblat, had direct connections with the Manhattan Project.

**Sandy Weber:** Good morning. I'm Sandy Weber. I'm the Reed Interpretive Specialist in the Office of Interpretation and Education for the National Park Service here in Washington. And I came to that position after more than thirty years in the field as an interpreter, a curator, a historian, a ranger, a park manager, and a preservation planner. What we're talking about here today fits in very neatly with what we're trying to do in the Park Service right now. We're right in the midst of revamping our guidelines and our policies on interpretation and education in our training programs, so that

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hopefully our interpretive's can do a more sophisticated brand of interpreting, no longer looking at things as isolated events or features in a park, but as a part of a much longer continuum both scientifically and historically. So this meshes pretty neatly with what we're also discussing in house.

Sam Walker: I'm Sam Walker [00:15:00]. My most recent book is on college basketball, and that's not why I'm here today. I'm also an author on a book on Truman and the bomb.

J. Newlin: Good morning. I'm J. Newlin. I'm Director of Physical Sciences, Engineering & Math at the Science Museum of Minnesota. My particular interest is in finding ways to present the phenomena and engage people in experiments as far as it is possible with the underlying physics of the Manhattan Project.

Art Molella: Good morning. I'm Art Molella, and I'm the Director of the Smithsonian Lemelson Center for the Study of Invention and Innovation, and we're talking about innovation today. I guess I'm also here because I did an exhibition at the Smithsonian Science and American Life, and that got me into things atomic. A book that I wrote a few years ago on urban history looked at dispersal of cities with the bomb. It got me into Oak Ridge, and it was on technology cities. So Oak Ridge was one of the technology cities in that book.

Richard Rhodes: I'm Richard Rhodes. I'm a member of the Board of the American Heritage Foundation. You probably know too of my books about the development of the atomic bomb, and then *Dark Sun* about the hydrogen bomb. There was a third that looked at the later dates of the cold war culminating at the Requiem Summit, and then a final that dealt with the post-cold war years and nuclear weapons. I'm currently writing a book about the Spanish Civil War, so that's a little earlier.

Cynthia Kelly: Fantastic. Well thank you all again for coming. We have obviously a very talented and diverse group that together is just the right team I think to solve all of these problems. One of the goals of the session is to have a lively interactive discussion. So we're going to have presenters take the first half hour, with the exception of the first kickoff speakers. The next core sessions will involve someone from the humanities and somebody from the museum world presenting on the same subject, one the substance and the other interpretive strategies. And then they'll throw it out to the entire group here to weigh in and give ideas. There are no wrong ideas. We want a lot of collaboration and just energy of your thoughts and experiences.

With that said, we also have second roles of reflectors. If your name is a reflector, your job is to be listening. Everybody should be listening, but [00:18:00] the last fifteen minutes of the session is for wrap up. The session usually runs an hour and forty-five minutes. So it's a half hour presentation, an hour discussion and fifteen minutes for wrap up, and the wrap up is going to be summarizing and doing this in teams. We'll just play it by ear. It's not formal, but it'll help immensely in distilling these thoughts for the record as we move forward.

Unidentified Male: Are you going to have a breakout in this session?

Cynthia Kelly: No. There is an opportunity for breakout. We had an organizing committee that voted that yes, we should have a breakout at the end of the day on Friday. So Friday will be where we'll split into two or more groups to look at not only the issues using the Manhattan Project as a case study, but looking at how can this discussion benefit the field of Informal Science Learning in

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general. What are some of the next steps, some of the research? What other recommendations for the field as a whole that have come out of this two-day discussion. So that will be the topic for the small groups, and then we'll have them report back at the end of the day tomorrow. But all the other groups will be in this room all together. For the sake of the transcribers, if you can try to speak one at a time, it'll be a lot easier for them. But I know it happens that you can get really excited at a brilliant idea. Are there any questions? Al or Fred, do you want to make a comment about your expectations?

Al DeSena: We could talk forever I think. But I think that one of the things that is helpful to emphasize is that obviously our programs funded the work that you're doing. It's always a rigorous process to get NSF funding. And so the fact that you're here is testimony to the importance that we place on the activity in advancing informal education in the science museum field, but also in advancing scholarship. We don't co-fund everything that we do at NSF, but this was one that Fred and I got together and we said, "We've got to co-fund this one." So it's just a little bit of a validation, and maybe Fred wants to add to that.

Fred Kronz: Just to say that I think we should be doing more together.

Cynthia Kelly: Well thank you. We are very appreciative of your support for this. It couldn't be timelier [00:21:00] as I said. We are on the brink of launching this internationally. As maybe you've noticed and some of the people here will attest later, in the two days this subject matter is of great international interest. Visitors to the B Reactor that we mentioned earlier, which is at Hanford, came from sixty different countries. They were limited to just the ten thousand that could get a seat on one of the tour buses. And I know Los Alamos has thirty percent of the people going to Bradbury or from other countries. We're speaking to the world here, especially with the Internet. Our website that we just put up recently on the [Voices of the Manhattan Project](#) have had hits from Indonesia, the Arab world, all over the globe people are interested in the Manhattan Project. They're particularly interested in our short video on how to load the reactor. Alex's website has got two million hits on how to blow up a big city. We have to figure out how to engage the public.

Alex Wellerstein: My blow up the big city application after the North Korean test, ninety-nine thousand people went and saw how big the latest bomb would do from North Korea on their city in one day.

Cynthia Kelly: Okay. We have to do a little musical chairs. I mentioned that before. I'm going to slip out of this seat and let Richard Rhodes, Alan Friedman, and Bud Rock sit up here, so that the cameras can zoom in on them during their presentations.

Unidentified Female: For those of you who have PowerPoint presentations, if you have it on a flash drive, I can pass it onto this screen from this computer.

Cynthia Kelly: Okay, and then we'll move. [00:24:00]. Now you can see yourself on camera.

### [Presentation: What the Public Needs to Know about the Manhattan Project by Richard Rhodes](#)

Richard Rhodes: That's a little disconcerting. Good morning and welcome. I'm delegated to talk a little bit about what subject matter we might comprehend in this project. And also perhaps a

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bit about the form the project will take to have a certain amount of difference with what I've seen already in the documents that we have before us. That is conditioned in part by the fact that I was on the Smithsonian Committee that was involved with the Enola Gay debacle. That was a bracing experience. World War II veterans felt so strongly that that exhibit should include no artifacts whatsoever from Hiroshima. Even that famous watch that stopped at eight fifteen, which was going to be one of the artifacts that the Peace Museum in Hiroshima was loaning to us, was simply anathema to these veterans of the war who felt that their comrades had fought and died, and that anything that even remotely indicated that the Japanese side would receive some kind of recognition was unacceptable. I don't mean that was frightening, I just mean that it was clarifying if you will. I think all of us know that from the fact that we've been scholars and studied these issues, just how very complex this subject really is. Notice even already, we've been laughing a little bit nervously about jokes about blowing things up. That I think is the [00:27:00] crux of the issue about how do you present a subject, which on the one hand is a rich and deep vein of history of technology and of political and international issues. And on the other hand, has a little bit of the stench of weapons of mass destruction around it. That I think is the heart of the problem.

The official purpose of the workshop led me to, "Develop ideas for presenting the history of the Manhattan Project and its legacy to the public via a national traveling exhibition and other means. Such an exhibition would be the first to treat the Manhattan Project and its legacy comprehensively," which I think is interesting in itself. I've been researching a book on the Spanish Civil War, and have been fascinated to find in Spain all these years after Franco's death, the war is still not something people can easily discuss, or that museums are yet prepared to present artifacts relating to it. The Enola Gay experience I think was one extreme. Another was brought home to me when I was at a dinner party in Washington some years ago, and was wearing one of those little badges that they had in Los Alamos to admit them into the explosive testing part of the laboratory complex. The lady seated next to me at the dinner asked me what it was. It just had a number on it. I told her and she said, "My God. That's like wearing a badge from Auschwitz." I was needless to say rather shocked at her response, but that in a sense is in the same range as the recent pronouncements by Representative Dennis Kucinich about this whole issue of having a national park. Which from his point of view in a speech that I was struck with its ignorance of the facts sadly I'm sorry to say, didn't seem to him an appropriate subject for a series of national parks. These are the cilia and charybdis that we deal with I think when we're talking about these issues in thinking about how to present them.

Whenever I'm baffled by these issues that surround the issue of the development of the energy of the nucleus and all of the huge transformations that it has brought to the world, I always go back to my touchstone, which is Neils Bohr. Bohr was perhaps the first really to think deeply and thoroughly about all of this and what it would mean in the long run for the world [00:30:00]. He came here to Washington in the summer of 1944, back before air conditioning, when the Danish Embassy got tropical hazardous duty pay for simply living in this City. Sitting in the Embassy putting buttons on his son's shirts, Bohr thought through this whole deep question. And went to Roosevelt and eventually went to Churchill. Churchill you know rebuffed him. Roosevelt was interested, but at that point not much happened. He was of course trying to convince the leaders that they needed to discuss all this with the Soviet Union before a bomb became a de facto announcement that we had a secret weapon that we hadn't shared with the Soviet Union.

But in the course of writing the documents that he shared with Roosevelt and would have shared with Churchill, he talked about, "The whole enterprise constitutes a far deeper interference with the



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national course of events than anything ever before attempted. Its impending accomplishment will bring about a whole new situation as regards human resources. Surely, we are being presented with one of the greatest triumphs of science and engineering, destined deeply to influence the future of the world.” He told of enormous energy sources, which will be available that he said, “Would revolutionize industry and transport,” as of course they have. But of more importance, he felt immediately was the fact that these new weapons would change as he said, “All future conditions of warfare.” He said that better in 1957. He said, “We are in a completely new situation that cannot be resolved by war.” To me that is the touchstone philosophic statement of what happened when we learned how to release nuclear energy. It’s a completely new situation that cannot be resolved by war.

Bohr, with his great sense of the complementarities of the philosophic world, as well as the physical world, was looking at what good might come out of what for many at Los Alamos according to Victor Viscop who remembered Bohr coming there in late December of ’43, was a really dark and deep dilemma for physicist who had as you know through the thirties thought of their discipline as one rather spiritual and disconnected from the practical world of politics and so forth. He said that Bohr came and he made some kind of clarity out of all of this. Well I think that Bohr [00:33:00] can offer us some clarity too. These discoveries, this new insight into the natural world required an adjustment that we’re still going through. And if we can somehow embody that very deep fact in the presentations that we’re talking about organizing, we will get at not only a way I think to present this information to the general public while avoiding these outlying feelings of horror on the one hand, and somewhat limited celebration on the other, we can also get at the real truth about what happened, which I think is not generally thought about, certainly not by the general public. It doesn’t go much farther as far as I can tell than, “We’ve got all of these bombs.” And either, “That’s great. We’re safe.” Or, “What the hell are we going to do with them?” There is that other part, and it’s a more subtle part perhaps. But I think it’s very much accessible to the kind of approaches that are available to museums and presentations of this sort. That’s a general discussion of the question.

The other part is it seemed to me that many of the framed statements that we’re working on during this program were framed in a way that speaks more to how historians think, than perhaps to how the general public in coming into an exhibition might think. My personal list in subjects, trying to think in terms of someone walking into a presentation of this subject would include these categories: science, bombs, biography, energy, and control. By science I mean the developments in nuclear physics from (inaudible) forward, to the extent that it’s possible to present these without overwhelming. I’m going to make a list that’s much longer than I think any single exhibit could offer. But it’s out of this body of material, fundamentally historical, that I think we need to draw for the exhibitions that we’re thinking about. Science is particularly suitable for exhibitions in the sense that it’s involved with real and physical objects, whether instruments in a laboratory, or natural materials or presentations of machinery of various kinds. These things are all there to be [00:36:00] more or less interactive to the extent that that can be made possible. I live near San Francisco by Frank Oppenheimer’s wonderful Exploratorium Museum. When the kids are running around that museum, it’s total cacophony for everyone there. And the things are whirling and lights are flashing. All sorts of interesting things are happening at once leading up I presume to the discovery of nuclear fission with the fundamental understanding built into the exhibition. This I think was why I put two hundred pages of the history of the development of nuclear physics in my book, [\*The Making of the Atomic Bomb\*](#), a head of the wartime story. The idea that somehow the scientists in a Faustian bargain sort of way, could have gotten together and said, “Oh, let’s not talk about this



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discovery,” is totally refuted by the history of the science that preceded it. You know that if the discovery hadn't been made in Nazi Germany in December of '38, it would have been made at Berkeley or in Paris a few days late. Everyone was ready. It was as someone said, “Over ripe.” Those of you who've had a chance to talk to some of the people who were around at the time, I remember talking with Glenn Seaborg, he was in a blue funk for two days afterwards. He just wanted around Berkeley; because he was a very ambitious scientist and he missed the most important discovery of the century from his point of view.

So I think it's important to do something to represent the preceding science to show that as is always the case with science, there's an inevitability about the discovery when it finally comes. But because of all the work that has preceded it. And therefore the bombs as they ultimately came to be, the reaction as it was in '38 and '39 followed logically from all the other things that had preceded. It wasn't something that a group of scientists could just simply lock up in a cave somewhere. The development during the Second World War of the science behind nuclear weapons, the creation of plutonium, the invention of the nuclear reactor, the physics of the bomb itself, is another aspect of science that could well be a part of the story. And I think again we give it connection to the larger world of science that it properly connects to. And then the post war world of nuclear science, particularly I think as applied to medicine, but also medical diagnostics, food preservation, which is something we don't see much of in the United States but is a major factor elsewhere in the world, [00:39:00] and with other useful applications. That's the science as I just roughly sketched it.

By bombs I mean not only the development of the atomic bomb itself and of the later development of presumably the hydrogen bomb and the proliferation of that weapons technology around the world, but also the previous history of strategic bombing. I'm looking in particularly in this book on the Spanish Civil War about the bombing of Guernica, which is a direct precedent to the bombing of Hiroshima. People who labor over the moral issue of the dropping of the atomic bombs I think have always been a little misplaced. The issue was decided when the United States Air Force went to area bombing and fire bombing in 1943 and 1944. The atomic bombs from the Air Force's point of view were not any larger in scale, as indeed they were not, except that you didn't need a thousand planes to carry them than what had been going on all over Japan before. So the development of strategic bombing, which I've always thought was a logical outcome of the horror of the trenches and the stalemated lines during the first world war, here was what looked like a magic technological solution. You could jump over those stalemated lines and go straight to the enemy's heart. And as you know, the strategic bombing theory could so terrorize the populace that it would rise up in wrath and overthrow its leaders and sue for peace, which needless to say never happened.

But most of the issues that we've come to think of as the deterrence debate had already been worked through before nuclear fission was even discovered. Indeed to all of these subjects I think there's a pre-history that it would be interesting to get at to the extent that that can be done. Again to give depth and power to this more isolated range of things that we're specifically centering our work on the Manhattan Project story itself and the story of the use of the weapons in Japan. Nuclear proliferation, which of course began before the first bomb in the form of Klaus Fuchs and Ted Hall and presumably some other people who we've never identified, that surely was the first category of proliferation. But it followed from there and in an interesting way from country to country. It always seemed to me matched until quite recently by another country that was going nuclear felt threatened by, so that you get this kind pairing as you go through. How you would talk [00:42:00] about it in a museum exhibition with these rather complicated political issues, I truly don't know. But of course there are all the resources that those of you here who are experts will I hope tell us

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about. I think the obvious is interviewing people and having their testimony there on tape. But the documentation is deep and rich. The question will be how to make it come alive. The invention of the hydrogen bomb, the Cuban Missile Crisis deterrence, these are all things that I think would center around the whole business of starting from one locus of how this virile development spread around the world, and it's still spreading.

Biography is sort of obvious, the biographies of the principal scientists and the military and political leaders who were involved all the way through. By energy I mean the parallel and complementary development of nuclear energy as a source of power, beginning with Szilard and Fermi's invention of the nuclear reactor, and moving forward through Atoms For Peace, which is a really interesting package. We're still trying to retrieve all of the highly enriched uranium that we dispersed around the world during Atoms For Peace. I talked to a couple of guys a few years ago who had been given the assignment of pulling the fuel out of a research reactor at the University of (inaudible) in Vietnam just before the North Vietnamese invaded the city. They didn't want to leave that HEU in North Vietnamese hands. They drove in on a truck and had to figure out how to pull the fuel. They didn't have any tools, so they calculated how much radiation dosage they'd get if they put their gloves on and pulled the fuel by hand. They threw it in the back of the truck and got the hell out. Those are wonderful stories if we can find them. Then we have the expansion of nuclear technology today to its present increasing situation as a source of world energy.

I was just at the Sundance Film Festival. There's a new documentary called Pandora's Promise, which received a great response at Sundance a little bit to my surprise. Because it's based on the fact that many environmentalists are changing their minds about nuclear power, realizing that if global warming, which is obviously here and now and real, that nuclear power is going to be one of the few sources of energy that can perhaps help deal with that immense problem. The director told me that he usually gets about a sixty percent conversion rate when he shows this remarkable documentary [00:45:00]. But it in itself was really quite educational. There's one detail that throughout this documentary where there's a hand, the director's or one of his associates, is holding a decimeter with a rather large number on the front simply stands in various places around the world from Fukushima to the black sands of the Brazilian beaches and shows the level of radio activity. And of course the black sand beaches down in Brazil are like a hundred nineteen, and Fukushima is nineteen, except for a few hot spots. It's really compelling to just see the facts for a change instead of hearing the endless debate about the virtues and vices of nuclear power. That's the kind of documentary, and of course there are many others, that might well be built into an exhibition so that people could get a taste over the years of how these subjects have been dealt with, but also learn from each of the documentaries. There are a lot of resources like that out there of course, including the museums that some of you direct, where materials could be pulled in for the traveling exhibition. By control I mean the efforts beginning perhaps with Bohr's approach to Roosevelt and Churchill in 1944 to control and limit these developments and to prevent nuclear catastrophe.

How these categories might be organized I don't know. They could be chronologically. I inevitably when I'm writing history end up going back to chronology, because it's such an obvious and straightforward way to organize history, which is chronological more or less. But that's not the only possible way. It certainly could be organized around subjects of various kinds with a sub-historical timeline within each subject area. It seems to me that this kind of structure could include the questions that were on the documents that we came to this meeting with in hand. Of course the question of whether we should have dropped the bomb, what were the circumstances that led us to decide to do so, those are eternal and interesting questions. I'm just thinking that if they're

presented in the larger context of the scientific and military and political reality historically, it might detoxify them a bit, and make them less susceptible to people breaking down the museum doors because they don't agree with what's on the wall. In a sense I think that those questions are a second level of discourse. And the primary level might well be the classic question of who, what, where, when [00:48:00], and then why. Why is the second level. Thank you.

Cynthia Kelly: I think that was excellent Dick. Thank you very much. I think we'll have time for a discussion after we hear from Bud and Al. Maybe Dick you can slip your chair over a little bit and we can get everyone on camera.

**Presentation: Communicating Science and its Social Context by Bud Rock and Alan Friedman**

Bud Rock: So let me begin at first by saying that in the reference to our friends at the Exploratorium in San Francisco, my concept of nuclear fission actually is those many kids, the (inaudible) of them running around the Exploratorium. I consider that to be probably one of the best demonstrations that we really have. My task this morning as Cindy had indicated, we're going to try balance this discussion between what I would call a set of content issues revolving around nuclear issues and the Manhattan Project. And then the messaging, the platform side of it. So for the purposes of this morning, my task really is to speak more broadly about informal science and about the science museum community, and a little bit about how we do the business that we do. And I will apologize in advance, because we have a room full of people, some of whom are well familiar with what I will say today, and others for whom it may be a little bit new.

I have to depart from my remarks though after listening to an earlier presentation and ask, "How many people remember our friend the atom?" When I was in school it was our friend the atom. I still have a copy of the book by the way, and it was shown on TV as well. It's fascinating to me how much messaging matters. I served in the State Department for five years in France, so this is a country with fifty-nine nuclear reactors. They're eighty percent nuclear and they really don't have difficulty explaining the content of nuclear power and what it really means. They do have issues revolving around nuclear waste in that aspect, but it's a nuance. It's an element. We with a hundred and four reactors in our country are still struggling with phase one. Messaging [00:51:00] does matter. So we're going to be talking about this from a historical context and also in a way guiding our future in the way we think about so many of these issues.

I hope folks can see the screen down there. I'm going to try to work from that if I may. Let me first begin with some very basic principles, and those have to do with Informal Science Learning itself. And I'm drawing here from what is now a highly regarded document by the National Research Council on Learning Science in Informal Environments. The strands that they refer to I think really summarize what we mean by Informal Science Learning. The first of which, and the most obvious of which, is sparking interest and excitement in science. The second strand, which goes hand in hand with that, is that clearly the idea behind this form of science learning is getting at the science content, getting at real knowledge with regard to science. But then once you go beyond that, once you get into the strands three and following, you're really focusing on the way we approach science reasoning, the way we engage in the process of science, our ability to reflect on what we've learned in science, our ability to use the tools and the language and the art form if you will of science. And ultimately and I think profoundly if we're successful, really identifying with what we would call the scientific enterprise, what it really means to deal with a science based society.

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So understanding science is more than knowing the facts. It really is a case of having our students build new knowledge and understanding from what they already know and what they believe. That's the starting point. And it will always be the starting point for good, solid comprehension of science. It means therefore that what they will be doing is they will be modifying and they will be refining their own concept, which may not be correct by the way, and adding new concepts to what they already know. Learning therefore is a function of our relationship with our social environment. And it means that the learners themselves are not doing this in a vacuum, they're doing it by interacting with others. So what we hear most often about Informal Science Learning is that effective learning requires the students to, "Take control of their own learning." It's something which is not done as effectively in the classroom as we'd like to see. So it means that ultimately what we're trying to do is get the students to do what we call, "Learn with understanding," which means more than the ability to repeat the facts, but to integrate those facts into their own lives.

I know this is a little hard to see at a distance, but there are a couple of studies that I think are rather profound in this regard. I point to the first one by Robert Tai at the University of Virginia, only because it indicates the fact that students who are inspired by science, by eighth grade [00:54:00] are three times more likely to pursue undergraduate degrees in the sciences than those who are scoring very high on standardized tests. The inspiration factor is really very important. And when we survey scientists, we find that many of them say they sparked their first interest in science by age eleven. And this is the time when information science experiences are most active and most positive. I always find this to be an interesting one. I use this mostly because people who talk about the OECD studies refer so often to the United States being twenty-first in the world in science testing. All of which is very true, but the OECD has done similar studies, which will be coming on in the next few months that show almost an inverse relationship when it comes to inspiration in science. And I say this with my apologies in advance to anyone in the room who happens to be from Finland, but Finland always scores very high in terms of the testing. This is not a fundamentally innovative and creative culture with some obvious exceptions. But they're not a fundamentally innovative culture, and many of the countries that are not scoring as high on the testing have found ways to bring inspiration and entrepreneurship into the science arena. And that is not happening exclusively in the school environment, it says something about what happens beyond the schools. What it says frankly is that the time we spend on science and math classes makes up about one percent of our waking hours. On the other hand, we are getting all sorts of information science education opportunities in the form of lifelong learning, and that is what's driving our perceptions in the science domain.

So what we want to be able to ensure is that we have non-school learning environments that provide these informal stem science learning experiences. And I just want to emphasize here that what we're trying to do is generate interest, we're trying to generate engagement, capacity, and we're trying to generate confidence in the understanding of science. With that confidence, presumably it will improve academic performance. And ultimately it will help those individuals who are succeeding to pursue further academic and maybe career paths in science as well.

This is my plug here, but I need to say a word or two about our association, which is made up of six hundred and thirty-five members in forty-seven countries. And our responsibility with our science centers and museums is to encourage this sense of excellence and innovation in Information Science Learning. This is a worldwide common goal. At the same time, we have made a fundamental shift as an organization to put a heavy emphasis on what we call Science and Society to proactively

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address those sciences based issues that are critical in society today. I always use an example that historically [00:57:00], and again for a few of you who have been in the science arena just a little longer than me, you might recall that years ago in the 1960's and '70's when we talked about a hands-on or an inquiry based learning experience in a science museum and we wanted to discuss say the human cell, what we would do is we would have a great big human cell and you'd press the button and light would go on for the mitochondria or the endoplasmic reticulum, and there it would be on a great big screen. Today the way that we approach that same subject is we have a discussion around infectious diseases in the world today, which says something about health, which says something about the human body, which says something about the human cell. We get at science principles in context in ways that are more meaningful to the lives of the individuals, or to the visitors who are having the science center experience. And it is indeed more an experience today than it ever has been.

When I speak about our many members, I think it's important to note that ninety percent of our science centers and museums are offering some form of classes and demonstrations in the science center environment. Almost ninety percent of them are doing outreach school programs. Eighty-two percent are doing workshops in institutes for teachers. Many of which are not just one-offs, but they are actually going as far as certification for science teachers in that environment, a desperately needed activity. Three quarters of them are actually providing curriculum materials back into the school systems, providing support to home schoolers. Almost half of them are purposefully targeting senior citizens, recognizing the lifelong learning process. We've gone so far as to calculate now that many of our science centers are also even providing youth support and youth employment programs to keep young people engaged in the science endeavor.

So what I'd like to say about this is that science centers and museums are becoming more centers of science in their communities. They're trying to become the platform that coordinates the science endeavor in the community in which they exist. That means that they pull in the activities of Universities, of corporations, of libraries, other community organizations. They form partnerships and relationships with research laboratories. They also form interactive relationships with other informal science providing organizations like zoos, planetariums, aquariums, and other forms. And obviously they have strong relationships with the school systems where they're located. What they would like to do in return is to become a community pool if you will for science, providing a whole spectrum of activities that we would consider relevant for science in society today, which means that today you might enter a science center and not just see an exhibition, you might see a tinkering [01:00:00] space, a place for DIY as we call it, Do-It-Yourself activities. You might see theatrical presentations. You might see actual research laboratory work under way in the science center itself where researchers are engaged in their activities being observed by those who are visiting the science center. You'll see more of what we would call "Database Management," more opportunities to bring information together and form consensus views on issues with online surveys and that sort of thing now being done within the science center itself. Needless to say, we do much more in the citizen science realm. We're beyond the point where the visitor to a science center is talked at. Now they engage. And by the way, our members receive about ninety-two million visitors per year. That's a number which goes up dramatically as we look around the world to places like China and India it goes up by considerable amounts. But those visitors that are coming to our science centers today are not coming in tabula rasa; they are coming in with views. They're coming in with perspectives. They might not be right, but they are perspectives nonetheless. And so our role is not to necessarily change their views or opinions, but to give them a better platform for considering them in an objective sense. We do periodically something that we call a "Trust Survey." In our most

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recent Trust Survey of our members has our trust at ninety-two percent, meaning that when people come to our science centers, this is where they expect to get fact so to speak. They don't expect to get bias, and they don't expect to get angles on an issue that doesn't give them a full objective evaluation. This is where they come for fact.

So you can expect that a deepened science center experience now is not just a visit to an exhibition. You are likely to be in a science center in a lively discussion, a debate that may be formally constituted. We come together frequently for discussions in the science center, or it might be spontaneous. There are many times when groups come together and use the backdrop of a science exhibition to open up discussions and debate. We also a lot more opinion surveys, consensus seeking activity, deliberate of inquiries as we call them, within the science center. We look at different mechanisms to convey our message, and I know we're going to talk about this a little bit more today and tomorrow. But things like theatrical presentations, we have more actors and explainers on the floor in science centers than we have scientists. It's about the delivery of the message. With that said, the concept of "Meet the Scientist," the opportunity to meet the professional researcher or to bring the amateur and the professional together in a science center setting is absolutely critical [01:03:00]. More and we are using the science center as a place for real time observation of science. You can watch surgery real time at many of our science centers. It's an interesting experience I have to say by the way.

I'm going to digress and I promise to go quickly to the rest of it, only because of one of the coolest things I ever saw. At the science center in Jersey City, they were doing an open heart surgery with a hospital in New York. They had a young group of students from Staten Island there. The surgeon of course has a microphone on the cameras are on him. One of the students raises his hand and he says, "I don't see any blood. I thought this was going to be really bloody." And the surgeon says, "The reason why you don't see any blood is because over here I have this clamp that's on the artery. I had to clamp off the artery so that I could see what I was doing." And then he said, "I don't think you can see this. Let me just unleash it." And he let's go of the clamp. The blood goes everywhere, and the kids will never forget it. I will never forget it. It was a great experience.

So in addition, the science center provides an opportunity for like-minded individuals to come together at all ages in science clubs and activities of that sort are also born of many of the science center experiences. I don't ask you to read these, but I did put these up here only to point out that globally we are taking on a lot of interesting issues by forming partnerships between science centers on issues that are important to the world today. Here we have an issue between California and Canada and Denmark on global energy consumption, students working together on these issues. There's another one on water and coastal management with Columbia and Florida at the Miami Science Museum. There's another one on climate change with Brazil and Mozambique. All of these along with a fourth one on water and health, these were all programs that were done through the science center activity involving the communities where they looked at the issue locally, and then the issue globally. The results of these activities were actually pulled together within the science centers and then presented at the Rio+20 Summit in Brazil this past year. All originated in the science center environment.

What I want to do really quickly here as I close this out is just to ask ourselves a few questions. The first is can we tackle socially relevant issues in the science center environment? Clearly we can. I give a few examples here, and the way that we will approach it is if for example you want to show energy conservation and "Building Green" as [01:06:00] the California Academy of Sciences has

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done, they can do this in presentation and they can do this by what the science center itself actually is. They have their living roof. It's not just an exhibit; it's an opportunity to show that the building actually exists through green design and through conserving energy. It is its own laboratory so to speak. When we talk about the variety of approaches to energy, we can literally create a virtual environment in our science centers, the so called "Energy City" at the Connecticut Science Center. Not only do you personal carbon footprint, but you can look at the ways in which varying decisions made in an urban setting will impact your overall energy efficiency and energy equilibrium.

Shifting to another topic with something of concern to the U.S. Department of Agriculture, the problem involves an invasive plant species. You have a museum like Montshire in Vermont where you actually take the science center out into the community, and you do the experimentation. You look at removal of invasives, you replant riparian species. And then you come back and examine these within the science center setting all done jointly with the school systems. I will point out that these last two projects are both funded by Federal Agencies. One is NREL, the Renewal Energy Laboratory in the case of Energy City. The other is the USDA for the program at Montshire.

So can we address controversial issues? How controversial is sex? They took on this topic at the museum in Ontario, Canada, in an exhibition called "Sex: A Tell-All Exhibition." It won't surprise you that it is very well attended. Equally significant for those of you who have not had a chance to see the exhibition developed at the Science Museum in Minnesota, "Race. Are we so different?" It's absolutely extraordinary. See the exhibit and then watch the people going through it. The impact of the messaging on race is done scientifically and it's done socially. It's done from the kind of perspectives that really define science in society. And then I'm sure many of you have seen or will see "Body Worlds," which exists at various museums around the world. Again, take a look at the exhibit and watch the individuals as they go through. It's a very meaningful exchange. I don't only want to limit it only to exhibitions, because in difficult issues like Communicating Climate Change, (C3) as we call it, the idea of community discourse globally based in science centers has had an enormous impact and have been very, very successful in the lead up to global conferences on climate. It was these community discourse activities in our [01:09:00] science centers led in part in the U.S. by the Museum of Science in Boston that spurred a lot of the young individuals participation in the discourse in ways that they hadn't been able to do through other non-governmental organizations. The science centers opened a whole new set of opportunities for that level of discussion.

Can we spark the innovator in all of us? Well most of us have heard about the issues of "Maker, DIY, Hacker, Tinker." All of these are ways that we look at the innovator, the engineer, the activist in science. And it comes in a variety of different forms. In Austria is FutureLab; led by Ars Electronica is a digitally based approach, as is our Digital Learning Labs that we sponsor by the MacArthur Foundation. The kind of work that's done at the New York Hall of Science, The Maker Faire activities, the Connections Exhibition. Sometimes it's just a matter of taking on an element of what is being done in your community that is technology based and helping your community understand it better. The Pacific Science Center for example, does a wonderful exhibition on the Hanford reactor. They also had local utilities ask them to explain to the community what it means to divert energy, to redirect energy, or to take on new energy forms. This is something sponsored by the utilities, using the science center as a platform to help the public understand.

Is there a relationship between formal and informal education? We've talked about teacher training, and we've talked about curriculum support. Let me just finally add that we have several activities



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that are science centered based that are focused on improving technological/science literacy. They're helping to bring back into the school systems a better awareness and understanding of things like engineering in our society, or reaching underserved communities like girls in Math and Science. There are many programs in that area as well. Or reaching out to specialized communities like with the Army's Cadet Command in joint programs with Fort Discovery, our science center in Augusta, Georgia.

And then finally, can we blend history in science? Many of our science centers and museums were actually born of the relationship between history and science, and they continue to incorporate these relevant elements into the museum setting. More and more we see natural history sciences and science blended together in the science center setting. I just happened to have been in Albuquerque this past week. There's certainly a great example there in our National Museum of Nuclear Science in Albuquerque that I know we'll talk about, as well as other science centers that are represented here today. I know we'll speak about those in more detail as it relates to the nuclear issues during the next few days. But this is [01:12:00] the domain of the science center and museum community. And we like to think that we have an enormous and positive impact through Informal Science Learning. We can't do it all. And I know that Alan is going to measure us by telling us a little bit more about some of the things that we may not do as well as we could. So I'll turn it over to Alan.

Cindy Kelly: Excellent. Thank you very much.

Alan Friedman: I'm going to try and put together the first two talks. Richard Rhodes challenged us to think about the possibility of could we create an exhibition to communicate these important things about the story of the Manhattan Project? What went before it and what came after it? I would expect everyone around this table, since Mr. Kucinich is not here, would agree that it's hard to imagine how you can live in today's world and function as a citizen and understand what's happening around you without knowing that story. The relationship between science and society changed forever with the Manhattan Project, and in the Manhattan Project of the seeds of issues that we're dealing with literally on the front page of the newspaper every day. Can we do it? So Bud has given you a very optimistic picture that yes, we have this incredible power and accomplishment in the world of science centers. And so you would think you just hand Richard Rhodes agenda to the members of the Association of Science-Technology Centers and it's done and we don't need to have the rest of this meeting. So how do we stand? I'm going to talk about tactics. What in fact we can and I think cannot accomplish. This is going to be a mixture of stuff derived from hard data; stuff derived my forty odd years of living in science centers [01:15:00], and a lot of personal prejudice.

Let's begin with reminding ourselves that science centers, although they are of course the most important part of Informal Science Education, nevertheless are only one aspect of it. What happens in aquariums and museums and zoos and botanical gardens and visitor centers; let's say in national parks, but also what happens on television, in magazines, in books, in libraries, on the internet, and in films. All of these contribute to what each of us accumulates with our relationship to science. What we know, our identities, our interests, and our attitudes. It surely comes from all of the above, and not from any one piece of it. That will become very important in a minute in my talk. Yes, the science center is where I earn my living so they're vitally important. And sixty-one percent of all adults physically visit an informal science institution every year in the United States. So clearly, we are a part of the solution to accomplishing the challenge Richard Rhodes set up for us. There are

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some things that we do pretty effectively. By doing effectively what I'm relying on here are actually hard evidence.

Evaluators like Kirsten here, go in and look at an individual exhibition or program or film and interview visitors, or viewers before they see the program. They interview people who haven't seen the program, and interview people who have seen it. They can guess statistically convincing evidence of what the people take away from the experience. And yes they do learn. Not a whole lot actually, but they do learn. And that in turn has a great influence on their affective domain experience. The fact that, "I learned something about nuclear physics. I could explain it to my little sister." We have some evidence of substantial lifelong impact. It's primarily in the affective domain, but to some extent in the cognitive domain. What kinds of exhibits or experiences are effective? Here's my short list, a single, big idea using multiple of a single concept. From aviation museums around the world the one thing people take away is yes, machines can fly. And [01:18:00] they have the following things all in common, except of course for helicopters. Then you have to go back and explain why in fact the helicopter does have a wing. It's just on top and it's spinning around instead of sticking out of the side. So multiple examples of a single concept, we can do that really well. A single story line or a single timeline we can do really well. The first project I ever worked on with J. Newlin was a story about time keeping. It was a linear story that told of our relationship to time over a thousand years, could tell it really well.

So what do we have difficulty communicating? We have difficulty in communicating a complex story with many multiple moving parts and anything with ambiguity in it, and anything involving multiple intersecting themes and characters. The bad news is the Manhattan Project story contains all three of these severe challenges to what we can do well with the medium of exhibitions. I'm showing here two examples of failed exhibitions in my humble opinion, supported by some hardnosed evaluation. One was an attempt to talk about everything to do with nutrition. The other was an exhibition trying to communicate a probability theory using a roulette table and a computer. The bottom one was abandoned at this stage, because it so obviously didn't work and it actually reinforced wrong ideas very successfully. Given that what we need to do to communicate the Manhattan Project story in the depth and breadth that we need, is it hopeless? And of course I'm not going to stop talking, so you can imagine that it's not hopeless.

What are the tactics for telling complex, ambiguous, multiple-themed storyline effectively? First, use a mixture of interpretative modes. Artifacts are only a part of it. Live interpretation is a big part of it. One example would be using media. Richard Rhodes mentioned videos. And yes, videos can be incredibly effective. Site-specific place based learning. I'm going to close with that one. I think it's extremely effective, and an opportunity that we have [01:21:00] until the Department of Energy tears down the rest of the Manhattan Project sites.

I'll give a couple of examples of these, but if we can't have the real site recreating sites, using juxtapositioning, one way we've learned to tell complex multi-faceted stories is by juxtaposing different kinds of objects, different kinds of storylines. And it's not that people get each storyline in detail, but that they can get why these two storylines are different. Multiple perspectives on a single theme is one really good way to do this. Video interviews for example with people of competing views turn out to have attractiveness and holding power. So people are attracted to seeing a debate, and they stay to watch it in part to see who wins. But they get to hear both sides of it, and then begin a discussion on their own. This happens more often than not. This can also be done involving the learner personally and emotionally like in an exhibit like the Race Exhibit that Bud sited. It's not

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just that you're learning about the Science of Race. If for example you see a picture of yourself on video of you and you would get to choose your race. You can click African American or Asian, and you see your facial features transform. I know that millions of people have had that experience, both through the Race Exhibit, but also through an exhibit at the Millennium Dome in Britain. No one ever forgets it. You can use that as a springboard for lots of discussions.

Finally there's individual character storytelling. Bud mentioned the large number of actors employed in science centers in "Science Theater." And by the way it's a legitimate theater. So Michael Frayn's play *Copenhagen* to tell a part of the Manhattan Project story is really powerful. People go away arguing as they leave the theater. How many of you have been to the Churchill War Rooms in London? In my mind that's the most successful single example of using essentially every one of the techniques that I mentioned. There's now a Churchill Museum, which is not as quite as successful, but it's in the same physical location. You are involved. You are down in the secret war rooms beneath a government building where Churchill in the entire head of the World War II effort during the blitz [01:24:00] stayed and worked. Churchill actually slept in it a lot of the time. They'd emerge, but then they'd retreat back in there. And apparently the Germans never did know that it was there. You're walking around in these narrow corridors. You are seeing rooms, which fortunately the day World War II ended they locked the door and forgot about it. Some thirty years later when someone unlocked the door, there were the war rooms with papers spread out on the tables and maps with pins in them right up to until D-Day. They were perfectly preserved. They also use lots of multi-media experiences. You have the conflicting views. You have the various narrations. There's an excellent audio tour. There are periodic tours with people. So I think that's an extremely successful example for telling a complex interlocking story. Now I'm actually trying to remember if it gets as far as Hiroshima. I don't think it does.

Another of my very favorite examples is Science In American Life, which unfortunately is no longer there. It was an exhibit from the Museum of American History. Although it included the Manhattan Project, it's the entire history and interplay of science and American self perception. An American civilian perception of science is told using again a whole variety of techniques. Not by the way ending when you get to the gift shop. In really effective exhibitions like this, the gift shop becomes the significant next stage of the exhibition. You can buy books. You can buy videos. You can buy posters. At the Churchill War Museum I walked off with a World War II blitz cookbook of how to make decent, nutritious meals out of leftover potato skins and whatever you had. So the learning can go on far beyond the exhibition if we offer these opportunities to follow up. The latest of which of course is giving everyone a web link with personalized stuff on it related to your visit. Some mixed evaluation results on whether that's effective or not.

Now I'm going to return to what I think is probably the most powerful example of which the Churchill War Rooms are one, place spaced learning. When you are on the Battleship Alabama in the upper left, you can't help but want to [01:27:00] learn a lot. You want to learn about the life of the sailors. You want to learn about why the Executive Officers cabin is not a whole lot bigger than the Junior Officers, but it is bigger. You want to learn about how the people worked, how they ate, what they did, what it was like engaging in war on a battleship. It's the same thing for aircraft carriers and all sorts of other big military hardware. There is almost nothing that you're not interested when you're physically there. If any of you have been in a submarine, you know what that's like. It's a gripping personal story. It's putting the visitor, the learner, physically and emotionally in a setting. If you don't have a real battleship or the real environment, you can simulate one, sometimes to excellent affect. So the Naval Aviation Museum in Pensacola, which is

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in the lower left, has recreated the deck of an aircraft carrier complete with the signs on the walls, the fire hoses, the flooring. It's all fake. But in the middle of it are real airplanes, real spare parts, and real shipping crates showing how on the hanger deck of an aircraft carrier you kept World War II planes flying. And I think that can be very effective.

And if you can't do that, at least grab a tiny piece of the real thing. I took this picture on the right yesterday. This is in the lobby of the Forrestal Building of the U.S. Department of Energy, which has a section on the Manhattan Project. I think not nearly accomplishing all the things we would like to accomplish, but some nice bits, including this door. This purports to be a door from Lawrence's radiation lab at UC Berkeley from the Manhattan Project era. There's even a little sign explaining how they're actually all not that sure, but legend has it that Mel Calvin, who later won a Nobel Prize, when they were demolishing the buildings, saved this door. Somehow it came into the possession again of the Department of Energy. You can try to recreate place, but believe me, it's not as effective as being in the loading room for the twelve inch guns on the Battleship Alabama.

I have just a couple of other examples. On the upper left is an exhibition project I'm working on as an Advisor to describe the engineering of the Golden Gate Bridge. And it's at the Golden Gate Bridge. In the foreground are three models of suspension bridges, and in the background is a much larger [01:30:00] model of the suspension bridge. You can actually play with how the bridge would be if the towers were a little higher or how would it be if they were a little lower. What would the bridge look like? How would it be different? So you do it on the spot. In comparison a couple of miles from here in Washington, there's a fake bridge supported on a beam. The text I can't read from here, but I think it says, "Cable Stayed Bridge." It's supposed to show you how a cable stayed bridge works, only it doesn't really work, because the whole thing is sitting on a steel beam, and there's no real bridge nearby.

On the lower left is a flight simulator. And yes, flight simulators are exciting and attractive. Over dinner last night J., Mac, and I talked about flight simulators. But on the ride is a kid with a paper airplane in front of a Concord. And believe me that kid is learning more about the aerodynamics of flight playing with it. It's actually a part of that museums function to get the kids different kinds of airplanes and try and figure out which one will fly further. And to do it in the presence of real airplanes makes a difference.

Unidentified Male: Alan, can I just mention on the Golden Gate Bridge was in my portfolio from a funding point of view at a site about a year or so ago. They [audio is turned off 01:31:34], which is basically for all the folks who are working on repairing the bridge and doing research [audio is turned off again 01:31:42]. He said, "Well, maybe if you get vertigo or you're concerned about blowing off." So I said, "But it's a once in a lifetime experience." So it's an elevator that only two people can go up at a time. So talking about place spaced experiences, he didn't tell me that the elevator doesn't go all the way up. When you get out of it, you then have to climb up two vertical ladders and go through hatches, and then you pull yourself out on the top. And then when you're there, there's like maybe a four foot wide railing area that you can walk on the top of the tower. You're seven hundred and fifty feet above the water at that time. So it was beyond a museum experience.

Unidentified Male: You mentioned the Battleship Alabama which is good, but to me another interesting thing on that was at Nauticus down in Norfolk where they have the Wisconsin. Several times in there they do [01:33:00] a session that's very interactive where you are participating as a

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part of the team to design the ship. It's basic criteria of course, but it's very, very effective. And then regardless of how people vote to make it bigger or make it smaller, then you get to argue the tradeoffs, "The bigger size won't go through the Panama Canal." It's very, very effective.

Alan Friedman: There's one more example. I tried actually the other slip to show you. How many of you have seen the TV series "Homeland?" It's one of the most viewed Showtime series about the Department of Homeland Security. There's a character at the beginning who may not be a Marine war hero, or may be brainwashed and is now a terrorist. The climactic moment for me at least of the first season is when he's at the Gettysburg Battlefield. He's talking to his kids about what happened when the Confederate soldiers came over the rise on that hill over there. As you listen to him describing the Battle of Gettysburg, you in fact find the answer to the question in what he's saying. It's a very good example of place spaced learning. Everything else in this series is very artificial. That I actually believe. I shouldn't believe it, he's a British actor any way pretending to be an American. But describing to your children your most deeply held beliefs by describing a historical event that happened a long, long time ago, but he did it because he was there. The actors playing the kids really get this. With that hill, I can actually walk where they walked and went to their deaths. So yes, I'm a very firm believer in the incredible power of real place spaced learning.

Unidentified Male: A very similar experience is going to the Down House outside London. It's the residence of Charles Darwin who wrote *Origin of Species* and several other books. You do precisely the same thing. You walk the sand walk that Darwin walked every day. You go to the garden when he grew the plants that were the basis for his understanding of natural selection. There is no substitute. I will hit on a little bit of this about some of the buildings in Oak Ridge later on today. But play spaced learning is powerful beyond belief.

Unidentified Male: You know I think it's important to know [01:36:00] who is it that's learning in these experiences. We have a tendency to at least in the science learning community, to gravitate towards young people. And that may be true; however, what we are asking them to learn can be somewhat sophisticated at time. And what you will see in many of the museum settings is mechanisms to allow for learning at all ages, almost simultaneously. It's curious with the amount of times you'll see an explanation of something high up at the same time as an explanation that's down low. That happens so that the caregiver or the parent who is looking at the exhibit at the same time that the child can grasp that information and then convey it back to the child right at that same time. Obviously we all would like to be able to say toward that notion if the child turns to you and says, "What does this mean," and you don't know, you'd like to say, "Well let's explore it together." It doesn't always work that way. And the parent or caregiver who can grab enough information at that time to provide an answer and an explanation and then take it to the next level makes for a much more fulfilled experience. So I think we're going to be talking over the next couple of days about some very sophisticated topics that can be approached at a variety of levels of learning. We'll need to kind of scope that out. How much do we want to convey at each age group? How do those groups interact with one another in the learning process?

Unidentified Male: As an example of one that just begs for better interpretation and active stuff is Hoffman Prairie. It's a strong, powerful experience to be there, but it's just there. There's nothing that would help somebody who doesn't know about the rights and the process of development of like to grab them and pull them in and really understand and get a sense of how important it was to be right there at that time.

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Unidentified Male: We're getting into a little bit what we'll be discussing tomorrow, but what is the single most important thing that would change that right now to be there? We've already acknowledged that if I'm standing at the location, that's a profound experience in its own rite. But what makes it profound beyond that? When you're at Gettysburg the example is an interesting one, because it's true that people who walk the Battlefields have a profound experience. But it's made all the more profound when they use to have the chance to see the big guy around that explained what was going on at the same time. So there's something that [01:39:00] accompanies that site-based experience that takes it from interesting to actually a learning experience.

Unidentified Male: An example of the picture in the lower right is in Duxford. And Duxford is run by the Imperial War Museum, but it was a World War II spitfire base during the Battle of Britain. So they have preserved one of the rooms where they have the little model planes that were being tracked by the Coast Watchers, so that they knew where the Germans were, and they were dispatching the spitfires. There's interpretation, which when I was there about ten years ago was done by World War II veterans who were mostly in their nineties. So I'm not sure what they're doing now. But the people who actually flew spitfires or worked in those spaces were interpreting the exhibits. I've watched families with senior citizens and with little kids all with their mouths open in awe, "You actually flew a spitfire?" And then they have spitfires flying around for real. You can go up in a spitfire. It costs about a thousand dollars. But I took a ten minute ride in something called a Dragon Rapide, which is only about sixty dollars. This is a between the wars biplane. It had seven passengers, and was powered by two engines about the size of a lawnmower. It's an astonishing, totally enveloping experience. If you just saw the field it's nothing. The field itself is just a piece of tarmac like Roosevelt's field in New York, which is now a shopping mall with a tiny bit of field. There is an aviation museum there however, but it doesn't make use at all of the actual field itself. You have to take up the challenge. Just having the site with a single sign saying, "This was once the Battle of Britain's premier field" is not going to do a whole lot. But if you can preserve any part of the structure that people can go in, if you can engage in this multi-level, interpretative scheme, I hope that they had videotaped those flyers from World War II. And I hope they have younger people who were trained by them who can describe in first person, "Here's what I was told." But those live tours by the actual veterans were I think the centerpiece, plus the thousand airplanes and other stuff.

Unidentified Female: Alan, I think what you're talking about really though poses a challenge [01:42:00] for the Manhattan Project, in that you've got multiple sites. B Reactor, which I did fall in love with last fall when I got there, but one of the great things about it is you do have the tours. You walk into this huge complex. I have no idea how a nuclear reactor works, I'm a historian not a physicist. But the great tours that they do there with the people who work there, we don't have that at Los Alamos. The original laboratory is long gone. So how do we recreate those areas? We do thankfully have the Bathtub Row complex where the scientist lived and Fuller Lodge where they ate their meals. So you get some of it, but you don't have that cool lab stuff.

Alan Friedman: Right. One thing by the way is that this doesn't have to take place in a single visit, and it doesn't have to take place in a single place. One could imagine a Manhattan Project Heritage Trail. You get a little booklet at the first one you visit, which lets the staff know that you've been to six or twelve sites, however many. And this does take place in many areas. If you visit archeological sites in Greece, you can get a booklet of all the other archeological sites. Aviation museums, you can just go online and build your own check list of the ones you visited and the ones you've missed. It's sort of like bird watching. You get a life count of historic planes that

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you have seen and that you still want to see. I still haven't seen the Valkyrie, XB-70, which is at Patterson. But after a day and a half I still hadn't gotten to it. So I've got to go back.

Unidentified Male: The other thing I was going to say is that also we're looking at a traveling exhibit. So then you've got scale. You look at the B Reactor and you look at K-25. How do you recreate scale whenever you have something that big?

Unidentified Male: When I took the question on when we were doing the 2013 report, you end up having to recreate a part of it, or a section, like a withdrawal alley that would have four cells down each side in the north tower. There were two in some of them. You could probably put two side by side with that on all the levels, but then you're going to have to use some graphical stuff to get the extension of the plant for the next six that are down there. There are some fancy ways of doing that. It's not a bad idea to call in some folks like Disney to see how you can do it so that your perspective and your sense of it shifts as it should as you move around. One of the other key things on that, particularly since they're going to have to reproduce [01:45:00] the section, is that you've got to get the details. NASA wanted to fold the equipment out for instance with the Mercury control room. I went down there to look at it before they demolished the building. One thing that they had left in the corner was one of the very early rear projection big screen monitors. One of them had been dismantled, but the other one was there. I said, "Get that out of there. That should be a part of that." They said that they don't have anything to show on it. And I said, "Well, make something up." But the point is you've got a very interesting piece of equipment there that you may think is ancillary, but it's important to the context. As you say the fire hose is on the side on the carrier. These kinds of things are vital if you are to put yourself in place of somebody who worked there.

Unidentified Male: I think one of the words we're going to be talking about a lot of over the next few days is we're going to hear the word "experience" a lot. So the question is, "Are we trying to create experience?" And more and more in this informal science settings, it is not about being spoken to or being spoken at, but being a part of the learning process making it an experience. And that's going to put us somewhere between an invented environment to create or to recreate a sense, and a more of a collections mentality with things that we'll observe and see. This is not just a historical notion. It's truly even in the way we look at science centers in the future. We're seeing more and more digital media incorporated into the museum setting, which is kind of an odd thing. It's not just going to a movie and seeing an IMAX, but going to a museum and then seeing something on a screen. There's an example at the Bishop Museum in Hawaii that comes to mind. Here they are in Hawaii and they're doing a digital representation of underwater oceanography. And so you get to pretend that you are swimming in the ocean. The only thing that really makes that an impactful experience is that along with that are objects. If you just had the collection it's not a lot of impact. If you just had the digital experience it's not a lot of impact. But the idea that I feel that I'm swimming and finding that starfish and then here it is over here in the collection is a combination that we're starting to find has greater value. It's the nature of particularly young people want to define as an experiential [01:48:00] activity. It's not what they observe. It's what they become a part of. We're going to have to work a little harder at that I think than has been the case historically.

Unidentified Female: And drawing on our current fascination with role playing games, and creating those kinds of situations where you take on the responsibilities of various players in whatever scenario you're working out. You engage in that with some fellows. Everybody is doing it now in online games. It's a great opportunity.



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Unidentified Male: And what's interesting about that exercise in the science museum setting or in this information science setting is that we truly try to emphasize that it's okay to fail in that environment. You can experiment, but the implications of that only last as long as the exercise that you're in. There are two things that we draw from that. One is that you're not necessarily coming away with a singular conclusion. You've delved more deeply into the issue as I think Alan indicated. Lots of times when people come away in heated discussions from an exhibition, and that's okay. And the other thing is that if you started down a path to learning something and it was a dead end, because you didn't get what you expected or the role you played was not the one you really wanted it to be, that's okay too. That's a part of the learning experience. One of the things that people should know is that when you go into a science center and see a lot of kids running around doing a lot of activities that seem to be aimless, in many instances there are teachers for example who have been there in advance and have looked at what's going on and are taking pieces of that experience back to build into the curriculum or the formal education process so that you can have that combined engagement.

Unidentified Female: Do you want people to come away from this exhibition having heated discussions?

Unidentified Male: From my personal perspective I want every exhibition to have heated discussions at some point. I think that the process of learning is as important as anything else. There are virtually no biases that I can think of in the science center community. Evolution might be one. But even there, we open up the discussion platform and we hope that that will be inspirational. But I leave it to others how wide you want that gap to be. There's room for a discussion on all of these topics. How wide do you want the gap to be in that discussion? I think that's something we need to explore over the next couple of days.

Unidentified Male: I think one measure indeed is the amount of discussion. One of my [01:51:00] former colleagues from a long time ago did his dissertation riding home on school buses with school kids who had been to a museum, and just recording what they talked about. And by the way, it was never about the exhibition, it was about who they had lunch with, and what they were going to be doing after school. However, there was a follow up in which he discovered that yes; they do talk about their experience, just not on the bus going home. So you would like discussion I think, but it doesn't have to be heated discussion. On the other hand, when you get to something like the Manhattan Project, there is probably lots of room for healthy heated discussion. The decision to drop the bomb for example and the dismay about what happened to the Enola Gay exhibit was an incredible lost opportunity. I actually was in a group after we'd been to an exhibit about something to do with the bomb with Mel Kranzberg, who is a distinguished historian of technology. At the time I was much younger. So I'm giving what at the time was my view about the decision to drop the bomb. Mel said, "If I had had a different history I would have felt the same way you do, but the day I learned about the bomb I was on a troopship headed for Japan. I was a Private in the Army. We had been told over and over again to look at the person next to you because one of you won't be alive in a few months. So there was no question in our minds when we heard that the bomb had been dropped that half of us were going to be alive or at least uninjured." Now whether they were told accurate information, was that really a consequence, what were alternative policy decisions? I do think that's well worth a heated debate.

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Unidentified Male: I guess for me the question about heated is an interesting word here. If people leave an exhibition debating these issues with some new information that would be one thing, but if they leave and are simply back at this endless circle of debate that would be too bad I think. Somehow this exhibition has to provide that too, perhaps.

Unidentified Male: I guess my concern is that people aren't debating it at all. They aren't discussing at all. Too many people have a view of either, "We're totally powerless to have anything to do with the forces that flow around science and technology." Or, they are indeed locked into a single belief that hasn't been changed. So [01:54:00] if anger is the way to break the lock I'm all for anger.

Unidentified Male: As new information becomes available, this exhibit might have to change. I'm thinking of the wonderful work by the Japanese American historian who I think has rather definitively established that it was the Soviet entry into the war that lead the Japanese leadership to decide to fold-up, not the atomic bomb per se. That's the view in the last four years since the book was published, and I don't think it's even been fully absorbed yet. But it makes the atomic bomb to some degree irrelevant.

Unidentified Male: That's a really good point. Some museums are very diligent about updating their exhibits on a regular basis as new information comes in. Again I do apologize, I do like many things at the Department of Energy, but if you go to the exhibit today on Independence Avenue, you will see a lot of crowing about how wise the Department was to select Yucca Flats as the repository for high energy nuclear waste. And it's in six or seven places in that lobby exhibit. What a great decision and what important they have done. Nowhere is there a mention that it's not going to happen. So the failure to update these exhibits can really make you look stupid.

Unidentified Female: The first session here has two minutes to go. Let's wrap it up. What takeaways do we have from this discussion?

Alex Wellerstein: I have one very brief thing. One thing that I've noticed with this session and this discussion and even the pictures of people in museums and things like that is there is a very important demographic shift going on at the moment with regards of the history of the Manhattan Project. We are rapidly getting to the point where there are not very many people who have worked on it, and we are rapidly getting to the point where the college student of today has zero experience of the Cold War. They ask questions. My wife is a high school teacher, and her students ask questions like, "So why were they afraid of Communism?" It's a great question. Nobody would have asked that twenty years ago. Our relationship with the history of the bomb is shifting very rapidly too. We have a distinctly Post-Cold War sort of generation. I think except for Alex Levy, and maybe even this person here, I checked with James, my first political memory is the Berlin wall coming down. So I have [01:57:00] no reference point in the Cold War personally to my understanding of the bomb. It's all Post-Cold War. So this is just something that I think we might need to think about, because one of the things that you both are talking about here in a way is conjuring up a sense of historical antipathy of feeling that you understand these people. And then it's going to be much harder when people's grandparents were not in World War II, and they have nobody they've ever met who was in World War II. That date is approaching rather quickly as well. So I think that's a very big issue. The other big question is this question of conveying the scale. And one of the things about nuclear weapons that is distinguishing amongst perhaps any other sorts of technologies is that the scales are orders of magnitudes bigger than anything they experience on a

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regular basis. This is what this website that I made shows you what nuclear effects are. It's not even a new genre, but it's new to a lot of people still, the idea that you can figure out how big a ten kiloton weapon is relative to you. Maybe they think it's so big, or maybe some people think it's smaller than they expected. But all of that is about trying to convey the scale, and even that's not adequate or successful. So that was more or less what I wanted to get out there. Thanks.

Unidentified Male: I have to thank all three of you for your presentations. I think science centers do have capacity—I think that we're really right to think about what many people call submersion; that being within a situation really simulates learning, and that you've used lots of techniques to be able to do that. The thing I think is really important is that people have to be a part of the presentation. I think the old model of a traveling exhibit where we put it out on the floor and you charge admission or not, and people go through it and people break it down every evening and that's it. It's just not an adequate way of engaging visitors. You need the first person whenever you can have it like actors. We had the Titanic exhibit recently, and we had the actors playing various passengers and crew on the Titanic engaging people with their stories. They had studied the history and they spoke the language of the time, and were fully knowledgeable of their history. It lengthened the time engaged and it also really got people on a very much deeper appreciation of what the story meant, which is actually [02:00:00] well before the Cold War. So it could become real to the people who were involved.

Unidentified Female: Had they seen the movie?

Unidentified Male: I would imagine that many of them had.

Unidentified Female: That's it. We need a movie on the Manhattan Project.

Unidentified Female: Well thank you presenters. Those were excellent. What a great start to this conference. We now have a scheduled break.

### [Presentation: Moral Responsibilities of Scientists by Andrew Brown, Kelly Moore, and Art Molella](#)

Unidentified Male: Are we ready?

Unidentified Male: Ready.

Unidentified Male: Alright, I'll start. Good morning.

[Background conversation – inaudible]

Art Molella: I just irrigated the platform right here [laugh]. I don't really have any prepared remarks for this. I've got something that I'll talk about later tomorrow that I've just been reflecting on this morning and I thought we might, it might help frame the comments coming and what I heard this morning, as a matter of fact. They're just very brief comments on this. The very first thing I want to say is we're talking about exhibitions, and having spent thirty-five years or so – well, a little bit less than that – in exhibitions, that I know that they're an extremely powerful medium that we're dealing with. It's an explosive thing all in itself. And I think the power of exhibitions are very easy for us to underestimate these days. But I think they're probably at least as powerful as books,

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though maybe not as enduring. You can read classics many years later. But I think they're very powerful for the public and maybe just a shade less powerful than movies. They occupy some of that space, especially when you're dealing with very broad publics. I think we just really have to think about how powerful something like King Tut could be and I think the Manhattan Project is in that league.

And I think within that category, public exhibits are a very special case. And of course, the Atomic Heritage exhibit, the Manhattan Project exhibit is going to be one of those special cases. And you get some escalating visibility and risk and interest with Federal exhibits, as well, which this would also be.

I think there is a tendency to see these kinds of exhibits as so-called official exhibits, you know, speaking for the government, if not the country. So that's something that we really have to keep in mind when we put these out, even though we have obstreperous visitors these days and they talk back and so forth. But I think we have to keep that in mind.

I think having been at the Museum of American History for close to my career, that history these days is... history museums and history exhibits are very much at the center of public debate about history and its meaning today. These are the kinds of things that are debated in books all the time among scholars. But it was surprising to me to see how people like Daniel Boorstin, who were running our museum at one time, who really brought the museum and the exhibits into the center of debate about the new history, for example, the new social history. So again, you can't underestimate, I think, the importance of these places, epicenters of debate about history at large as we discuss it in the nation.

I think that [00:03:00] this was especially true of the aborted Enola Gay exhibit. This really brought many issues out of the Academy into museums for well, good – mostly ill, in this case because the exhibit disappeared. It was interesting the relationship with academe. I see Peter Kuznick here and I think, Peter, you took a lot of the presentations from that exhibit that were not shown over to American University, so there was an interesting kind of symbiosis going on. And the debate really did engage broad publics and actors, as well as academics and that, as well.

So thinking about the Manhattan Project exhibit, we can't underestimate the power of – we can't overestimate the power of the platform [inaudible] something to bear in mind.

Finally, I think it's very important to realize that exhibits are their own thing. They are visual and they're sensory presentations. They're esthetic, even when you're dealing with maybe repugnant issues in an exhibition. They're still esthetic kinds of things and they appeal on these emotive levels, affective levels probably more than on the rational or cognitive side of things. So we have to reckon with the kinds of emotions that it will provoke.

Finally, exhibits that, because they are like this, they mean both more and less than you ever intend in your presentation. I think especially with a subject like the Manhattan Project, the kinds of artifacts you put out there, the kinds of visuals you put out there, can be extremely powerful but not do exactly what you maybe think they can do. There's a lot of evaluation that goes on in these kinds of things but there's an awful lot of ambiguity built into these artifacts, and they can escape from your control very easily as you do these things. And that can be both good and bad. They can enhance what you're trying to say, but they can also undermine.

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So that was just kind of a statement about the genre we're dealing with because that's how we're centering this discussion today and tomorrow about that, seeing that relationship between the academic knowledge, the scholarly knowledge, the book knowledge that exists, and the presentation to the broad public.

Andrew Brown: Well, good morning. I've been charged with talking about the moral and social responsibilities of scientists associated with the Manhattan Project, and having listened to the opening session, of course, one immediately sees that as an abstract and nebulous topic, it must be a nightmare for someone running a museum or a science center. Thinking about it myself, I came up with the notion that morality is a lot like gravity. It's a pervasive force, which is essential [00:06:00] for human activity but like gravity, is a weak force and it's easily overcome. I don't know how that would sit with professional philosophers but most Manhattan scientists weren't professional philosophers.

They, of course, came to the Project from different origins. So you had some from England who had been subjected to forming raids in the labs. You had European refugees from the Nazis, some of whom had families left behind in Europe. You had young American scientists whose brothers were fighting in US Army military.

So I think the first point I would make, these were mostly young male, very intelligent scientists who were not neutral. I mean, they were deeply invested in winning the war, which is something we sometimes overlook. And I think although there's an obvious disjunction resulting from the Manhattan Project, science wasn't regarded as uniformly beneficent by the start of the Second World War. So it was certainly the legacy of the first World War with things like poison gas. The fact that in Europe and Africa, probably more people experienced aerial bombardment in the 1930s than ever took a trip on an airplane.

When it comes to the development of the bomb, although these topics are abstract, they're obviously central and profoundly important when one is discussing the consequences of the nuclear age. The first mention, I think, explicitly came in the Frisch-Peierls memorandum of 1940, which was a semi technical document pointing out that you could actually construct an atom bomb if you were able to isolate enough pure Uranium-235. And Frisch and Peierls put into that document, they understood the scale of the destructive explosive power that they were proposing, and they said in the memorandum somewhere that this may make it a weapon unsuitable for us by this country. They also pointed out that exactly the same information was available to those scientists still in Nazi Germany and that the best safeguard would be to develop a weapon of one's own. So the deterrent argument was right there in the Frisch-Peierls memorandum.

After the MAUD was written, [00:09:00] fleshing the proposal out in more detail and sent to the States, when it was eventually read by leading US scientists, administrators, Conant and Bush, they also expressed moral reservations. In fact, there's a letter from Charles Darwin, grandson of Charles Darwin, who was in charge of the scientific office of the British Embassy in Washington, writing back to London say that Conant and Bush wonder whether the President and the Prime Minister would sanction the destruction of Berlin and the country around it in one single blow. So again, they're in 1941 and this was in August '41 before Pearl Harbor, before the States had been in the war. These men again asked the question as to whether this was a morally justifiable weapon to develop. Those sorts of crumbs disappear, I think, as the momentum of the Project takes over and it

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becomes more of a military industrial undertaking. And I think it's easy to overestimate, actually, the importance of the scientists and to underestimate the industrial nature of the whole project and the fact that developing fissile material was the challenge. And it's something you think about now with the Iranian weapon development. It's so far along the road that murdering Iranian scientists is really irrelevant to the progress of the project.

There was a pause for reflection, particularly after the scientists had been to the Trinity test where they witnessed the scale of the explosion. And you had the Franck Report recommending that there should be a demonstration of the weapon before it was used in anger and also pointing out that if it was just used without informing the Russians, it would be very difficult to persuade them to come to trust you in any international agreement, having used that weapon already. And the British had already talked about Niels Bohr's heroic, but ultimately unproductive, efforts with Roosevelt and Churchill.

I think one of the other things I would say is that if you actually look at the behavior of the scientists at the time, the reaction of a lot of them after the news of Hiroshima and Nagasaki was to celebrate because of the wartime conditions. And Otto Frisch, who was a rather reserved character, said it was [00:12:00] sickening, the sight of people booking dinners to celebrate having developed a weapon that led to the deaths of so many thousands of people. I think on reflection, most scientists lost that sort of enthusiasm quite soon.

I have just written a book on Joe Rotblat, which taught me that, in fact, we'd like exemplars of morality. Saints are invented for a reason; they appeal to us. And I think I was not firm enough or explicit enough in the book that the burst of events propagated by Joe Rotblat, and eagerly embraced by the rest of the world, were not really the full story. I mean, the myths for those – not the myths – but the legend is that once he realized that the Germans were no longer in the position to produce a weapon and it was obvious that they were going to be defeated in Europe, that there was no justification for proceeding and he left the Manhattan Project, really, as a moral decision. It was actually far more complicated than that because his family was left behind in Europe and also, there was a political reason that General Groves and Chadwick had thought it would be better to have him back in England. But just suggesting this when I was researching and writing the book caused quite a lot of consternation amongst his friends and colleagues, who would not accept that, in fact, there was a serious security charge to be answered caused by his behavior at Los Alamos and the reason to leave was complicated. And those sorts of things are difficult, I think, to convey, set against this very appealing story that he was a man with an overpowering conscience who was different from the rest.

The postwar legacy of the Manhattan scientists, I think, is the most important thing in this regard. Obviously, they founded institutions that are still going, such as the Bulletin of the Atomic Scientists and the Federation of Atomic Scientists. In the UK, there was the Atomic Scientists Association, which actually, you had one of the first exhibits after the war – the atomic train, which trailed around first the UK and then, actually went to Europe and was immensely popular with the public and even [00:15:00] made a profit of people coming to see the exhibits.

And then Pugwash itself was founded in 1957, which the founders had a heavy contingent of Manhattan Project scientists. And the things that I think fascinated me when I was writing the Rotblat biography was really the interaction between those scientists who had become staunch antinuclear campaigners and the ex-colleagues who were still on the government's side. And there

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were very collegial relationships, I think, between people like Rotblat and Bill Penney, for example, who was the head of the Atomic Weapons Research Establishment at Aldermaston. And when the Test Ban Treaty of 1963 was signed, Seaborg, who was, I think, still the Chairman of the AEC at that time, presented a book to Bill Penney. I mean, both of these were figures regarded with some loathing by certainly the public, you know, if you were the head of the atomic weapons research establishment. And you know, they had worked as hard as anybody to try and get a total ban on weapons tested and Seaborg apparently inscribed this book to Bill, "We almost made it." And I think that's something that is interesting to look at, the interaction between independent academics and those who were still working in government service.

Then there was the interaction between the scientists and the politicians. And I think certainly, in the 50s and 60s, the interaction was favored by the fact that you had statesmen who were seriously interested in the issue of nuclear proliferation, mostly because they had direct personal experience, I think, of being in a war.

And there were amazing connections around the universities, both in the UK and here, for example, centered on Harvard where you had men like Paul Doty. Paul Doty worked for a brief time as a chemist on the Manhattan Project and then, went on to become a biochemist at Harvard, started the molecular biology department at Harvard, hired Jim Watson, kept him out of trouble. And he also found time to make about forty visits to the Soviet Union in order to give lectures on molecular biology and to discuss with the leading scientists of the Soviet Union the problems of weapons control. And within this group at Harvard was Henry Kissinger. So these sort [00:18:00] of personal relationships were very important.

On the question of what are the lessons from the Manhattan scientists for today's scientists, I think it's unlikely that any contemporary scientists are going to face any moral dilemma of such profound severity. But it was an obvious one. These scientists were working in wartime and as I say, they were committed to winning the war and producing this weapon. It seems to me that moral dilemmas that may face contemporary scientists are rather more subtle and difficult to spot. So if you're a software engineer, how do you know how your product is going to be used? What are the dangers of it?

But it must be an argument for scientists to remain engaged in public and political debate. They probably had the major influence the earlier they get involved. It becomes much more difficult, and I think that the applications of scientific technology research become more worrisome once they are scaled up by private industry or by governments. And at that stage, it is far more difficult for whistleblowers. They run greater risks in contravening either security restrictions or commercial applications if they start opposing various inventions.

So I think the lesson of the Manhattan scientists after the war is that their contribution was immense in terms of peacekeeping. People like Rotblat and Doty just devoted untold amounts of time, even figures you don't think of who are not quite as well known. I mean, Rudolf Peierls as a physicist in the UK, apart from being an active member of Pugwash, would go out on the streets of Oxford on a Saturday morning and just talk to passersby and get them to sign petitions. So it was a really extraordinary effort and I don't know, in the modern world, who would be prepared to do that.

Kelly Moore: Well, that's a hard act to follow, but let me try. So thank you for [00:21:00] that. I want to start out by making a couple of points. First of all, I'm so excited to be part of an activity



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that involves getting public involved in thinking about these issues in informal settings. Over twenty years of teaching, I've been preaching these alive on museums and I'm thrilled to be in a city that has a number of very interesting science museums that have become invaluable in having my students get excited about science and think about its social implications. So I am excited about the project, in general.

I'm also mindful of a couple of things, I think, that Alex raised earlier today, which is that when we're trying to think about what to present, not only do people have no experience with what this thing was, etc., my students sometimes think it's like a music thing or something, Manhattan Project, they're not really [laughter]... These things make no difference, right? The idea of an Iron Curtain, one of them thought was actually a curtain of some kind like the border fence in Mexico.

So in terms of what we're thinking how to connect to people, I think it is useful for us to think about those issues. But I also want to frame what I'm saying in terms of some ideas that I think I have always taken for granted, but which I think might be useful in thinking about the ideas of social responsibilities of scientists. The first is the idea of the public. The idea that there was a public, a uniform public, a set of people who you could think of as the American citizen. As historians of the social sciences have shown us recently, that was, in fact, kind of an accomplishment in invention to think about what this public might be, rather than a sense of a differentiated people.

The second is the education levels were obviously much lower than they are now. We didn't have an average education age of, I think, of twelfth grade, I think, until sort of 1980 or so. But back at this time, it was much lower, so eighth grade, ninth grade, something like that. I raise those two issues because I think they're relevant to the question of what should scientists have done, what did they do, and how did they conceive of their so-called, their supposed social responsibility?

So let me start to say that my own specialization is not in the Manhattan Project itself, but in postwar understandings, particularly up through 1975, what it meant to be a socially responsible scientist. And the first idea that I want to put forth is that there were diverse ideas. I think that Andrew has made a set of arguments about the early period that are convincing, and if you haven't read his book, you should read it. It's really great. A set of arguments about the different ways in which people conceived of this. Some scientists thought of their responsibilities in terms of personal individual responsibilities, some of them grounded in historical experiences like [00:24:00] having a bomb dropped on them, being refugees of different kinds. Others thought of themselves as having a collective responsibility; that is, that they didn't identify themselves as people who were both refugees and scientists, but as scientists who had a particular kind of responsibility.

The second set of issues that were hotly debated was responsibility to whom. Should you be responsible, for example, to the government? Many of the organizations that Andrew's identified for us – FASS [PH], the Pugwash conferences, a variety of others – were trying to assist governments in making good decisions about what to do. But after 1956, there were new organizations that were trying to do something else, which was to reach this so-called public with information about what atomic fallout could do, what the effects of radiation might be. Some of them saw themselves as critics who were countering what they thought were overly optimistic narratives that were given by divergent and different parts of the US Federal Government about whether things were safe or not. The Federal Government, various agencies has lots of ways of doing damage control, trying to present a unit front. But they were confronted by the fact that

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people didn't know all the details about exactly what fallout might do and how radiation might affect people.

So these scientists, and I particularly focused here on one that I wrote about in my short piece here, one of the earliest groups to form to engage in this kind of public information delivery was the awkwardly named Committee for Nuclear Information in St. Louis. One of the things that I'm thinking about in terms of an exhibit which, to me, is exciting – and I've actually been able to convince 18-year-olds that it's exciting – was to think about the idea that these were people in a city which had had atomic fallout coming down on the city. People didn't know exactly what it was, so people played in it. Everybody here knows the stories, right? Made snowballs out of it and did other things with it. But there were groups of people who began to raise questions; particularly, mothers, about whether this was getting into their children, was it getting into milk. They began to ask questions and looked to scientists at Washington University in St. Louis for assistance. Again – and Angela Creager's area of specialization – people did not know all the details about what exactly this was doing. They undertook some kinds of activities to try to figure out, to test the milk and find other things.

Not surprisingly, they had debates about the fallout. Should they tell citizens neutral facts? Should they themselves gather up facts and say that we didn't know exactly and we should be precautionary? Or should they not say those things at all? Maybe they should speak to the government. But the concept of who they ought to be, to whom they were responsible, and [00:27:00] what to do in the face of uncertainty was a major issue, and one that was also, I would say too, something that Manhattan Project scientists also faced.

The concept of social responsibility, even to be responsible requires that people have some knowledge of the consequences of their action. Sometimes they may have unknown unknowns, sometimes they're known unknowns, right? To put those in shorthand terms. People also need to have options of various kinds in which they can act. In the Manhattan Project, they had more limited options. People were not free to act on whatever they felt like acting. There were serious consequences if they behaved outside the bounds of this culture of secrecy. But after the war, those conditions had changed significantly. So after 1956, people had more possibility for discussing and debating.

Another factor that is, I think, also critical to keep in mind in thinking about what were the so-called social responsibilities of scientists is that by the middle of the 1950s, scientists were breaking into many more subfields than they had before. So we have a proliferation of not only physics, but ten different, twenty, thirty different kinds of physics. Departments spread rapidly, so you do not have one uniform scientist, you do not have one stock character out of Central Casting who acts on one kind of moral program.

So one of the senses here then is thinking about groups like the Committee for Nuclear Information. Barry Commoner was one of the people who was actively involved in that and as many of you know, he's also quite controversial and he passed away recently. There's a fabulous biography of him that's been recently written. But he's also a controversial figure. He did not shy away from controversy. He believed, by the middle of the 1960s, that it was imperative that a scientist who thought that there would be danger should, in fact, share that with the public. That is not shared by all scientists. Not all scientists think that it is their obligation to tell publics much of anything. Some of them think that their obligation is to tell government, government makes the decisions. But those

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points of view, I think, are widely represented now. But by the late 1960s, there certainly were a wider range of ideas than there were under the Manhattan Project.

I am loathe to – we have to talk about this tomorrow and I'm sort of anxious about how exactly we're going to be drawing a line from 1939 to social responsibilities today. I myself truncated my own book at 1975 because that was about as far forward as I was willing to go in thinking through those effects of the Manhattan Project. Nonetheless, I think one of the lasting effects of the Manhattan Project in terms of the idea of social responsibility is that in the US, there is [00:30:00] still a dominant form of social responsibility, which is to present neutral facts, typically to government that makes decisions. That is not the only way that people discharge social responsibility. We have, for example, the Union of Concerned Scientists, the Natural Resources Defense Council, a number of different groups that take scientific ideas, disseminate them to the public, and actively lobby on the basis of them.

So in keeping with the fabulous presentations on what these exhibits need to be able to do, the central theme of social responsibility can be broke off into different ways that people thought about those responsibilities, including biographies that I think are really critically important. We've mentioned here, many of the people we've mentioned tend to be men who are scientists and the Committee for Nuclear Information. Among the most important people gathering, disseminating, and thinking about this were women who were really a critical part of it.

I also think that in thinking about social responsibilities and gathering audiences to be thinking about this is to remember also – again, as Andrew pointed out – these are people who have biographies, they have histories, they have experiences that shape how they think they should act and behave. It would be a mistake to think that there was one way of doing things.

And my last point I want to make is to suggest that in the postwar period, one of the most important things that scientists were also wrestling with was the question of radiation. Even by the late 1960s, there were still unknown questions and debates. Again, Angela Creager is going to talk about that topic. But the radiation, which was unlike a blast, not seen. It was hidden. People didn't know what it would do. It was lodging in people's bones, right? Strontium-90. Was it a good thing? Was it a bad thing? How would we know about this? And how should scientists act on the basis of uncertainty?

I do have one tiny thing to say, which probably nobody wants to touch with a ten-foot-pole but certainly, we have the same issue today with the changing climate, right? We have rapidly changing scientific ideas. People do not know whether they're going to be triggering events that are going to send things one way or the other. And we have lots of questions about what scientists should do. And the really regrettable and disappointing set of activities recently that has happened with the targeting and attacks on people who have tried to present science in a neutral way.

So with all of that, I hope that we can have a conversation about how this question of what it means to be responsible as an individual, collectively, and the changing forms that it took in the postwar period. Thank you.

[Background conversation]

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Unidentified Female: [00:33:00] That's at the end. Now we have a discussion. Now we open it up to everyone to ask questions, make comments.

Unidentified Male: Something I've been thinking about all along, and I think this discussion really brings it forward, one of the real problems that we're going to have to deal with is the problem of anachronism, historical anachronism. It's really what Kelly was talking about in terms of different values, if you will, at different periods of time. To be fair to the past is one of the hardest things to do when you're talking about issues like the decision to drop the bomb, and much else besides, in this very, very fraught situation of a weapon of mass destruction and what good and bad came out of it. So something to keep in mind and worry about is exactly how do you present all this without having – as schoolchildren evidently do these days – the trial of Harry Truman, the impeachment of Harry Truman for his decision to cause a weapon of mass destruction that killed a lot of Japanese citizens. That's too bad, I think.

Unidentified Male: One thing I have never heard in the discussion of Manhattan or postwar time or whatever is the distinction between science and engineering in the development of [00:34:29]. There's a different – and I don't mean to put this better or worse – but there is a difference in how the morality of all of this is seen because in the engineering side, there's a client whereas in the scientific set, theoretically, it's the muse, if you will. That brings a very different perspective and particularly, in the area where we have scientists trained as scientists practiced as scientists that are not having to do engineering tasks. It's put them into a somewhat unfamiliar setting. Now, they did perform quite well, but it is always talked about as being only a scientific thing. Not quite true.

And the second point, a comment was made that we won't see this kind of moral dilemma again. I would pose the question of Iran's nuclear program. Is that something that the West should intervene in preemptively? Or presuming Iran would develop that and actually attack, then respond to it? And if so, how seriously? And the morality of [00:36:00] all of that is very, very similar to what we saw in the 40s.

Unidentified Male: Yeah, and I just would say there's another good example having to do with the area of biology and genetics and genetic engineering and frightening things that Alex can tell you about here, which will make your hair stand on end, in terms of facing the scientists with more questions about what they're doing.

Unidentified Male: I think a recent example that's playing out on that is the development of vaccines against Avian flu, which is subject to a voluntary moratorium, which I think has now ended in some places, but I'm not sure that the US has yet decided whether to go ahead or not. But I mean, there was a problem that was identified by the people working on it as to whether they should continue to work with viruses in labs which hadn't yet been shown to infect humans but may well do with the risks of release of a virus or possible consequences of those viruses falling into the wrong hands. And that was unusual in being an explicit decision by the scientists to stop and think for a year or so.

Unidentified Female: I want to add a little bit more, too, to the question about the contemporary relevance and the difference at the Manhattan Project, and it has to do with publics speaking back to scientists. So today, there are lots of groups and organizations that are contesting science publicly. Everybody from patient groups who don't like what biomedical scientists are doing, people who

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don't think that... I mean, the protests against wars of various kinds. So there are lots of ways in which publics are part of these debates.

But here we also, at our table, we don't have representatives from some of the people who actually have been part of these debates and discussions – for example, Native Americans. Native Americans typically were miners, when they were miners, didn't have radiation badges. Jacob Hamblin at the University of Oregon, some of you may know, he's a historian of science and particularly interested in nuclear issues. One of his graduate students is writing a dissertation at the moment, which promises to be quite interesting, on Native Americans' experiences with mining and irradiation and the long-term legacies that they have faced in terms of cancer and other kinds of illnesses from that.

And again, do scientists... people knew there were some kinds of problems. Scientists had radiation badges many times but these people did not. Were there responsibilities for people to have done those things? So I want to make sure – at least from my thinking – that on one [00:39:00] hand, there are lots of examples of things scientists did to take up the mantle, and there were others kinds of problems that have never been taken up and haven't been thought about. For example, people who've had atomic fallout fall on them repeatedly when they were pregnant, so those kinds of studies and things we don't know much about.

But those kinds of things, bringing more kinds of voices to the table who might've been affected by this set of projects in the short-term and the long-term, I think would also be of value.

Unidentified Male: There was an interesting case of this, citizens reacting to big science as recently as the Super Collider, conducting Super Colliders. And while everybody was sort of going after this sort of pork barrel aspects of getting this cited in their community, what we discovered when we were trying to present this, that there was a whole group of citizens that had done... sort of NIMBY citizens. They didn't want it there and they actually launched a publicity campaign against this and it was a significant movement to stop – even though they were told it was the best thing for the community, best thing for physics and all of that – they fought it.

Unidentified Female: Yeah, and there are people of multiple points of view about those things, right? And about the positives and the negatives about these things.

Unidentified Male: One of the tricky things, I think, in talking about the more responsibilities in a museum setting, as well, is that we tend today to frame these in terms of the hawks and the doves. And Rotblat is always sort of the ultimate dove because he leaves and as you have shown us, even that's more complicated. But certainly, when you look at the other people who are involved in the project, even the atomic scientist people like Robby, Szilard, they don't fall into an easy modern dove category.

Unidentified Male: That's right.

Unidentified Male: That whole follow or nothing approach is really a much later Cold War sort of sentiment. And indeed, those people, the later people in the 70s were sometimes appalled at these people in the 40s who later became the good Cold War liberals who said let's make nuclear power and let's have control, but we're still okay in using the bomb and things like that. And how to tap into that, again, without the anachronism problem to make it... Part my most frustrating thing is

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when I see Oppenheimer portrayed as a dove because he opposed the H Bomb. I mean, well, yeah, but he wanted tactical weapons in Europe, right? I mean, it's not an easy either-or category.

Unidentified Male: I think somebody like Hans Bethe is another...

Unidentified Male: Right, exactly.

Unidentified Male: ...example of this after that scenario.

Unidentified Male: And how to present that in a way that is neither misleading nor vilifying. I don't really know how you do it. It's a very tough line to walk.

Unidentified Female: Along those same lines, when you think about the biography of these scientists, so many of them were approached by Oppenheimer to say not only are we going to develop this thing that's going to end the way but look at the discovery that we are going to make. Look at this science. And so they really were sort of following after [00:42:00] this pure science as opposed to the engineering, which you know, I come from a family of engineers. They're the ones who built the bomb. [laughter]

Unidentified Male: That's not what the chemists told me. [laughter]

Unidentified Female: So it's that idea of getting out into the laboratory and doing that pure science and not thinking maybe about the consequences of it at the beginning because it was oh, we're just going to go and we're going to... You know, we know the atom can be split. What can come out of that? What can we do? And so there's that really wonderful sense of discovery, and that's sort of what you want to get across to people in your informal science. And yet, at the same time, you have this responsibility.

And so Kelly, what I'm wondering, there's always been sort of a – I guess from the Hippocratic oath onward, there's been a scientific idea of social responsibility. But did the Manhattan Project gel that more so than maybe any other event that we had?

Kelly: Well, Peter can speak to the period before then, right? His book *Beyond the Laboratory*, in which scientists already out of the laboratory engaged in debates about race and about other issues in the US at that time. But one of the things that I think it did do was to present a dominant form of what social responsibility meant that was adhered to by people at elite institutions who had high-powered government positions. And because of the social status of that and also because of the risks of doing something else, it kind of gelled in the US as a particularly powerful way to do things.

But this was really... by the late 1950s, there were alternatives that were being presented to that. Do you just want to be giving governments information in this way or are there other things that one could do?

So I think there is still a dominant model of that. We still hear this about the debates – you're not presenting “neutral information” to the government to make those decisions. But in the contemporary period, of course, we have extremely high levels of secrecy. And we also have all kinds of information circulating – hacked information, leaked information – all kinds of stuff that's all over the place. And publics are used to, now, thinking about adjudicating these themselves,

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right? They go and gather stuff. This is the problem, people going to the doctor with their list of what they think should be done. But it's also the case that publics sometimes do bring new... draw attention to problems that people hadn't known about before. For example, patient groups are a good example of that.

But I would say that after this period, that this is the dominant model, remains the dominant model. But there are other competing activities that are always out there. And I think probably since 2004, that model is wobbling as the dominant way to do things.

So again, this exhibit will probably never take form until nearly eighty years after Manhattan Project [00:45:00], if we can think about that. So it's going to be a challenge, I think, in thinking about what does that model look like and then what happens to it over time, right? And to what extent can we trace these things back to the Manhattan Project as opposed to other things that raise questions for scientists like the war in Vietnam, like Star Wars, like stem cell research, and a variety of other things. To put them in contact with different constituencies and new generations of scientists who didn't think the same way as Manhattan Project scientists or even the students of those scientists.

Unidentified Male: The Asilomar scientists really took it.

Kelly: Perfect.

Unidentified Male: Another time, they were trying to preempt government regulation...

Kelly: That's right.

Unidentified Male: ...just rather than advising government. They thought if they had a moratorium on the research, that they would forestall this kind of thing. So it was a little bit of a variation of the learning of the Manhattan Project.

Kelly: Absolutely. And also, asking whether before things went... We have one way of thinking about we want to get products to market, we want to get these things done quickly. On the other hand, there are new pressures to say could we evaluate some possible outcomes of things like nanotech before it actually gets out there. And who are the right people to be at the table to be making decisions about what to think about nanotech, given that we have unknown unknowns and we have some known unknowns. So how do we handle those things? That phrase is not mine, it's from Matthias Gross' book on public experiments in science, but he uses those concepts of that.

Unidentified Female: So how do you exhibit it? [laughter]

Kelly: I can say exhibit is about people. It's about people in real time and place. I don't think it's about presenting everybody does things like this. I think it's about real people making context specific things. If you're a scientist on a college campus in 1969, it's hard to escape that people are disturbed about the relationship between the military and science and universities. That shapes particular people's experiences. So I think people is a good way to do that – again, you know, because I think that CMI was such an interesting group for having some confidence in the public, which most people didn't. That they could actually understand something if you simplified it and said here's the risks, here's what you might do, and then you make the decision. That was a kind of



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a radical thing for people to be doing at that time because people were not confident that people could understand this. And also, we'd had ten years of people encouraging "gee whiz" science with like "your friend, the atom" stuff, right?

So anyway, I think that the stories of people, I think, are important. I also think presenting the varied ways that people encountered [00:48:00] these things is important. And I think when people walk away from it, at least one of the things I'd like to see, is that people understand that scientists are not one-dimensional figures and that not every single problem – engineering, science, other things – one size doesn't fit all all the time. There might be some conditions under which acting publicly might not be the right thing to do, right? And there are other conditions under which one might want to warn everybody, so the tsunami's coming right now. But something like that, I think would be useful to conceptualize and to put biography... and I'm not talking right.

Unidentified Male: In addition to that, I mean, the focus of that issue has to do with atmosphere testing. This is where the rubber met the road. And you know, that concerned every mother, everybody, the whole population about how strontium 90 was getting into the milk and doing this and that, and it led eventually to a ban of atmospheric testing globally. Eventually. I mean, it's remarkable that the Chinese continued to test atmospherically up until like 1980, I think it was. Unbelievable. And the French...

Unidentified Male: And the French, yeah.

Unidentified Male: ...in the mid-70s. But anyway, this is, you know, unacceptable global behavior to test at all today. I mean, that trajectory has been one that's interesting to follow, that it was commonplace in the 50s and early 60s. You could be firing one off every other day. I mean, there were like sixty or seventy a year in some of those years. And eventually, now it's driven underground and eventually banned and we just saw the outcry about the Korean test, which is unacceptable to test anyway, anybody, anywhere, any time. So that story, it's been told a couple of times, but that could be the focus of an exhibit, I suppose, too.

Unidentified Male: Well, just that dramatic fifteen-minute Japanese artist's graph – some of you may have seen it online – that has a ping and a light for each test. You can almost see that a lot of our testing with the Soviet Union back and forth was a kind of very low quality communication system. [laughter] They would test ten so we would test fifteen, then they threw twenty, then we... I mean, then we'd die down and then they'd die down. It's fascinating to look at and taking all that history and squeezing into one...

Unidentified Male: That's a horrible... [multiple speakers]

Unidentified Male: That's something that belongs in the exhibit, for sure.

Unidentified Male: Yeah.

Unidentified Male: Yeah.

Unidentified Male: [Inaudible]

Unidentified Male: Yeah.

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Unidentified Male: I think, as I recall, the amplitude of the sound is coded to the magnitude of the test.

Unidentified Male: Yes, yeah, right.

Unidentified Male: I think what Alan was talking about, the personal [00:51:00] stories and trying to bring those out, what I'm hearing as a non-historian on this one, is that these personal stories are reflective of evolving social and political environments and changes in the nature of scientific – or at least purported – scientific knowledge. So as we're dealing with these kinds of stories and issues in the exhibit, I think trying to figure out how to put them into some sort of a cultural chronology that rationalizes that some of these stories today back from the early twenty-first century look like they were pretty irrational. But it appears, from what I'm hearing now, that in 1949 and 1955, the environment – political, social, scientific environment – was noticeably different from what it is today. Therefore, the behaviors and the activities of the scientists and the engineers were okay.

Unidentified Female: Different.

Unidentified Male: Understandable, perhaps.

Unidentified Male: Well, at the time, understandable. But I'm struggling with how this works into an informal science education [interruption] or product.

Unidentified Female: Talk about complexity.

Unidentified Female: Well, it doesn't necessarily... Look, I'm thinking about an exhibit. When I was thinking about what if you told the story of Joseph Rotblat, right? That's a compelling story, it's an interesting story. It's a story that doesn't lend itself to a straightforward "what a fabulous person who acted on some abstract moral set of ideas," but a situated actual person who had different ideas and was engaged in learning back and forth and had different communities of people he's in dialogue with. At an individual level, I think that would be wonderful.

I mean, this is only to say... The book that I wrote actually tries to say how do you make sense of different ways of understanding these decisions at three different time periods in which, in each time period, people are reflecting on what was okay about the past and what they didn't like. How is it that their predecessors' moral ideas do or do not fit the particular historical moment?

So I think it's possible to tell these kinds of stories and I don't think – at least, I'm not in the business of saying people were morally wrong to do X or Y. I think the job is to ask what are the variety of ways in which people conceived of these senses of what the responsibility was at a particular moment, right? So when you're going to think about making a bomb, what happens after the bomb is dropped? What happens after this period of severe political repression starts to lift? How do people reconceive of that? And what about all [00:54:00] this fallout, right? What do you do with that?

Unidentified Male: I think it's dangerous to try to put the Manhattan Project behind us in some kind of way, and you do that partly by stereotyping or making a very simple story when it's a

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complex story. And the reason for that is not to take the burden off of the historical characters in the past, but it's to show that this is... we're facing it today and what are we doing today where we're facing the same dilemmas and we have developed a context for justifying things. And I think that dialogue between the past and the present is one way to keep this alive for people to see. Yeah, we're facing the same thing right now but maybe somebody's going to judge us twenty years from now and see that we're doing some of the same things. And so we'd like to acknowledge now the complexity of our own situations. I think keeping it alive is very important for this project.

Unidentified Male: Just on the same point—in terms of how this is actually done in museums and similar centers, there are a number of ways in which people have reconstructed an historical debate using characters, but with exquisite attention paid to actually getting it right. So I'm thinking the City Museum in Grand Rapids, Michigan, for example, deals with a strike in the furniture industry that happened... I've forgotten when. And they have actors and actresses portraying individuals, but they are saying actual words that the people wrote at the time. And at first, it seems like it's going to be very simple. You've got the labor union guy and the factory owner. But then, you have the minister and you have the wife of a worker and you have... It goes on until you realize that this was not just a simple issue of the union wanted more money, the owners were cheap. It was a very complex issue. And the minister questions the morality of a strike, for example.

So I've seen this done also with live people, the use of trained actors and actresses who are able to work totally within character. But the most dramatic one that I saw, I can't remember what museum it was at, I apologize, but it was about slavery. And actually had a character defending slavery and using the arguments used at the time. Why it was better for the slaves this way, they live longer, healthier lives under slavery than they would have in Africa. And the audience, because you're standing around with this character, you have protests and is outraged and the actor stays within character. And you can begin to tease out not just how this obviously abhorrent view held sway, but how the [00:57:00] very assumptions about the nature of life and society and responsibility were so different for this person. So he didn't see himself as a bad guy at all. What was the moral difference? What was the circumstance that led to this?

So I think we can do remarkably sophisticated things. It's not easy. And every one of these historic reenactments is subject to challenge and doesn't always work well. Partly, it depends on the professionalism. The Science Museum of Minnesota, I believe, is credited, in general, for starting this use of science theatre and they used actors from the Guthrie Theatre and playwrights. August Wilson got his start writing a play for the science theatre at the Science Museum of Minnesota.

So not easy, but doable. And maybe the best way, in an exhibition setting, for approaching this. And one can imagine the debate between Szilard and Oppenheimer based on written things.

Unidentified Male: It seems to me the difficulties, Richard, to say is to be fair to the past. Because we don't want people to come out with the feeling that our morality is more developed than... And I think that's very natural to do, that we have to fight it in ourselves and in the exhibition.

Unidentified Male: I think there's also a problem with the attractiveness of certain individuals. So speaking as a scientific biographer, if you look at the bookshelves, Einstein sells, Darwin sells [laughter], Oppenheimer sells, and the rest are pretty much nowhere. [laughter] You're lucky to find them in the bookshelf.

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Along the same lines, the BBC, I think, did a six-part documentary on the Manhattan Project back in the 1980s, which was very well done in some ways. Joe Rotblat was actually an advisor on that production. And when I interviewed him, I said to him – because I was interviewing when I was writing my Chadwick book – and I said what happened to Chadwick? Chadwick was probably the single most informed British scientist associated with the Manhattan Project. And Rotblat said well, he was there to start with. And he said I kept telling him how important he was, but he was such a self-effacing character that with each revision of the script, he just got written out, written out and was eventually dropped altogether.

Unidentified Male: Insecure.

Unidentified Male: He needed an agent.

Unidentified Male: Exactly. [laughter] So there is a question of...

Unidentified Male: Having a play right now circulating around the country called Reykjavik. I'm here to tell you the more you listen to audiences, the less meat you have on your platter. [01:00:00] Reagan and Gorbachev are slowly evolving into two people talking to each other about their lives. When I started out with the transcripts of the Reykjavik summit and used the actual words, people said your audience is going to be in the parking lot, man. [laughter] But I think when you see it in context, you can probably stay closer to the documentation than perhaps in a theatre. At least, I hope so.

Unidentified Male: We have *Copenhagen*.

Unidentified Male: Well, *Copenhagen* is such a superb play, yeah. He did a good job of making it all happen in one place. I'm obviously not that clever. And even Michael Frayn, I met him when he was making the rounds and asked him what was going on. He said, "My play is opening in Copenhagen next week in Danish with the Bohr family in the front row." [laughter] And I asked one of the Bohr's grandsons later how it went, and he gave me one of those, "Ah, it was interesting." [laughter]

Unidentified Male: How does the Atomic Testing Museum deal with these issues? Did it deal with these issues? I've never been there but...

Unidentified Male: The bomb casings, and it has a small protest section about [break in sound] though. And it has a lot of atomic ephemera. But I'm trying to remember, it's been a few years since I've been there. But it's not extremely engaging. The closest they get to engagement – and this is not a criticism, I don't make museum exhibits, it's so hard – they have a fake atomic bomb testing theatre. So you go into and it shows five, four, three, two, one, and like shines a bright light at you and they blow some air in your face and then they show you a mushroom cloud and it's [break in sound].

[multiple speakers]

Unidentified Male: Do they deal with the fallout issue? Or the fallout controversy?

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Unidentified Male: I'm trying to think if whether there was much said. They have a little bit on the limited dust entry, I think. [interruption] ...they acknowledge that these existed but they don't...

Unidentified Male: [overtalking] ...war materials kind of museum at this point, at least. Bomb casings are really, really great exhibits. They must be a part of this. In fact, if you go to one of the museums and start out with the original H bomb, the one that was liquid deuterium and tritium, it's the size of this room. And by the time you work your way down, you've got them this size. That is a really compelling piece of demonstration.

Unidentified Male: I have a story about bomb casings. We brought out Fat Man and Little Boy from the Air and Space Museum for a demonstration (inaudible) [01:02:51] of Hiroshima. And they soon discovered they weren't just casings, the innards were still in those. [laughter] I don't think it's a payload but anyway, we immediately had to pull them off and take the stuff out.

Unidentified Male: It's just my comment that this is one of the areas in which that strategy that I talked about are multiple examples of the same thing. When I visited that museum in Albuquerque, what was most impression was the range of casings and the fact that they did get smaller. You wound up with the Davy Crockett that one person can carry in a backpack. And then overlaid on this are the stories about the rivalry between the services. So the Navy wanted its own nuke and the Army wanted its own nuke and the different divisions within the Army and the Air Force and the Navy wanted their own. And you begin to see some of the military industrial working out unrelated to the physics, to the science of the bomb. But the role that having a bomb just as it plays in international affairs can even play down at the level of every general wanting his own design.

It's only a part of the whole story, which is why, getting back to my point from earlier, we can't tell this story in a single exhibition. But we can make connections to all the places the story is told. So if people walk out of the museum exhibition with a copy of Richard Rhodes' book, a copy of a biography of Rotblat, if they walk out with tickets to a play, with a video of that BBC series. I'm working on a project now with... I'm making a documentary about Hyman Rickover. And that's going to have... There are some very interesting moments in that and definitely, it's an engineering point of view. In fact, one of the quotes in the film from Rickover is, "It's five percent physics and ninety-five percent ingenuity." And the way in which an engineer would approach the moral or ethical issues – or not approach them – compared to way a scientist would, far too much to put in any one medium of communication.

Unidentified Male: A big part of this is going to have to be a web presence of some kind, it seems to me, because that's what all the action is right now.

Unidentified Male: Mm hmm.

Unidentified Male: There's a lot of sophisticated stuff going on about that where people, to interact with the exhibit while they're there in real time but taking stuff away so it goes beyond DVDs and wonderful books.

Unidentified Female: I want to come back to the issue about the idea of sort of protest and just contextualize that again historically. Because the concept of protest as we know it was not as widely understood or used as sort of a political idea. And the people who were against [01:06:00] the proliferation of nuclear weapons during the 1950s and people doing things like the Aldermaston

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March and other kinds of things were people – often peace activists, some of them with communist ties, internationalists – but they weren't kind of protesting as we know it now. They were often holding vigils or other kind of things. And that there were more risks for people to do this public stuff, and you couldn't really find in the United States when people were wanting to question the siting of a nuclear reactor in Minnesota in 1963, they couldn't find any scientist who was willing to help them or tell them anything. And they also were fearful of going out and even being in public and saying we don't want this for fear of being thought of as communist, being arrested, all kinds of problems. So the form of public concern, I think, is not the same as taking to the streets that was much more common later in the 1960s.

The second point, too, is that it's also important to remember that some scientists were also part of these kinds of groups. So Albert Einstein was involved in the Society for Social Responsibility and Science up until 1954. And so he was also saying – coming from a peace point of view – he was doing these things. There were also people who were part of peace movements in the late 50s. There were also scientists by the late 1960s who considered themselves both antiwar activists and scientists. I don't want make everybody say let's have every version of complexity but again, the concept of the protesting citizen, the scientist, these things need to be understood, again, in historical context. Otherwise, we make the mistake of taking our present day ideas and sort of reading them backwards, defeating the purpose of, I think, what it sounds like we want to do, which is contextualize this and then make it real for today. How does this matter, what difference does it make?

Unidentified Male: You can put in charismatic types here. You can put in Linus Pauling or Bertrand Russell, people like that to...

Unidentified Female: Yeah, Hans Bethe, yes, all those people who...

Unidentified Male: You can match the personalities...

Unidentified Female: Exactly. But you don't want to – again, and I think this is Andrew's point about trying to think about these people in more complex ways than I'm just a scientist reporting facts, here's a protestor. And again, I don't want to say this, but the million variations because there are actually dominant forms at particular moments. But again, just avoiding the idea that it was like protest movements, which were one of the daring things civil rights activists did was to actually walk out in public and demonstrate when they knew they were going to be put in jail. And no respectable person did that kind of thing. So anyway, I found that...

Unidentified Male: So let me put this out here. Does anybody [01:09:00] think this could be the occasion for another Enola Gay event? Does anybody feel that there are risks of that for this exhibition? Maybe we should talk about that.

Unidentified Male: Well, the difference is that was in 1995.

Unidentified Male: Bad time.

Unidentified Male: I mean, Shelby Foote's famous remark about it takes a hundred years to talk reasonably about a war, we're just about there, which is to say most World War II veterans who were involved in this are gone or are almost gone. So maybe we won't.

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Unidentified Male: Congress gets in up in arms and then you have a big problem. If Congress is... It certainly is possible with the current Congress...

Unidentified Male: You never know.

Unidentified Male: ...that they would be offended. It takes one person in Congress to raise hell and you've got a real potential for...

Unidentified Male: Well, we already have Dennis Kucinich from the other side, from the left side.

Unidentified Female: One of the things that our community has talked about since the beginning of the proposal is the good thing that the National Park can bring to this is the ability to tell the story on multiple layers and multiple perspectives. And the fact that they can take the Sand Creek massacre site and not celebrate the Sand Creek massacre and the killing of Indians, but to tell people that story. Or to take a Japanese internment camp and say you know, we messed up here, but here's what happened in these places. And so the park service can... And is trusted. I mean, the most trusted Federal agency is the Smokey the Bear hat, right? So the Park Service can take this story and look at sort of a broader picture, certainly, than I think what maybe the museums in the communities can do. Because we all have our missions, you know. And so the Park Service, it puts a lot of responsibility on them but hopefully, we can all help them with that because that is how we avoid the Enola Gays. Let the Park Service do its job that it has done in so many places and done so well.

Unidentified Male: And Cindy is trying to say something.

Unidentified Female: I applaud the Park Service but I've seen some parks kind of dodge issues altogether, and this could be – and hopefully, it won't be what happens. Because I think the message of imperiled progress, the study that was done by the Organization of American Historians of the Park Service today and the state of its historical interpretation, promotes collaboration with others and multiple voices and so forth. It will require a lot of homework. I mean, just sitting here in this room listening to this conversation, I'm thinking okay, now how would I do this or that or [01:12:00] how can you possibly do all this in light of how little goes into, in terms of a museum, the text. I mean, Alan, you've sort of saved us by saying oh, no, they'll go to the bookstore [laughter] and then they'll bring home Dick's books and read the eight hundred pages. But you have to compress so much. Anyway, did someone from the Park Service when I talk?

Unidentified Male: Let me just add something to that that I was thinking about as we've been talking. These exhibits need to be physical. Anything that can be done digitally can be done online and I know there has to be some of that to present information. But to the extent that there are real bomb casings and real pieces of uranium ore and so on and so on and so on, those objects speak whole books just in their physical presence about what happened and when. And certainly to the extent that real people can be involved, or at least actors portraying real people with their words. It's to get the three-dimensional part of the story and the physical part of the story that I think is so important. I've thought for a long time that everyone should see the real bombs because they make the whole subject real for people instead of some abstraction that you can sort of wave away. There are real bombs in the world. They could go off. Nuclear winters could be a reality and so forth. You

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can't really get that ultimately from watching it on a digital screen. And therefore, this exhibit needs to be tactile and it needs to have smells and tastes and things to see and hear.

Unidentified Male: Fallout [01:13:51].

Unidentified Male: There is somewhat of an interpretive problem here. I'm not speaking officially for the Park Service on this, but it's my observation. We have gotten very good at beating ourselves up with parks dealing with things like Japanese internment and the explosion out at the (inaudible) [01:14:15] in Northern California and all of the things that are bad in American history. They should be in there. But to have them dominate is just as bad as having good dominate. It's just not realistic.

And what Cindy said about some of the sometimes it's PC, sometimes it's other drives in here, sometimes it's just a drive to kind of water it down where we don't want to make anybody mad or upset really defeats kind of the purpose of what I've heard here. What we would like is discussion. [01:15:00] Not just "Oh, that's nice, wasn't that fun kind" of approach. I would say if the Manhattan Project Park in the multiple sites comes about, there is a very good opportunity to tell different stories at each site to where they would all be complementary and synergistic. That doesn't mean everybody would visit each site and you certainly are going to have to have some documentary materials or video materials or whatever that explain the other ones like Hanford, Los Alamos, and the like to somebody who visits Oak Ridge.

This kind of thing is not terribly difficult to do but certainly, having the multiple venues would give a lot more opportunities to explore these from different angles. There's a whole lot more, probably, of worker experience, for instance, to be gained at Oak Ridge than there would be at Hanford. But the problems... And then again, the situation at Los Alamos, completely different than the ones at any of the two material producing sites. So there are some real opportunities here but there'll be some fights to make it happen.

Unidentified Male: This is a travelling show, is that right? So would it conceivably go to the various atomic heritage sites so they could build maybe their own stories around this when it's there temporarily?

Unidentified Male: Probably. Of course, remember too, one thing on Enola Gay, forget the one down here, but when the plane was displayed at Udvar-Hazy and they opened Udvar-Hazy, somebody threw a jar of red paint up against the side of it, it splattered, and you can still see the dent in the fuselage. So these things...

Unidentified Male: It's totally contextualized at Udvar-Hazy, by the way.

Unidentified Male: Yeah, it is, but there are people that build these kinds of contextualizations in their mind and want to make a statement.

Unidentified Male: I just want to comment about the... There's always the possibility of getting a controversy and have people going to Congress and trying to pull the funding because of something. There is now, actually, a fair amount of literature on how museums handle or mishandle a controversy. There's a book by Steven Dubin called *Displays of Power* and it's about controversial exhibits, most of them with the Smithsonian [laughter]... But not all of them. There's a chapter



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about the Sensation exhibit at the Brooklyn Museum of Art, which I know a fair amount about. And I don't think we're at the stage of being able to say here's what to do to survive it. I would say one thing the museum literature says is if you take a posture of [01:18:00] we're not going to do anything if you get us into trouble, then most of the universe is going to be off limits. But there are things you can do both to prepare for it and to try to avoid it, probably not completely successfully. Martin Hewlett's book about the Enola Gay exhibit, *An Exhibit Denied*.

Unidentified Male: Martin Harwit.

Unidentified Male: Harwit, thank you. Especially for a physicist reading it, it's very sad because in the opening chapters, he's trying to do the right thing. You know, his heart is in the right place. He actually is sympathetic to a range of views and then it just goes so clearly off the rails.

Unidentified Male: I mean, but that was clear. We were talking about being subtle in how we do things. That exhibit had lots of layers to it, I thought. But what happened is it got yanked out of the process before it was ever up anywhere, and it became a political thing. And it had everything to do with the changes in Congress, it seems to me. I don't anybody could've predicted that.

Unidentified Male: But I'm just saying that as this project gets undertaken, it's probably worth having a committee of people working on it to prepare for the eventuality...

Unidentified Male: The grief.

Unidentified Male: ...of conflict. And to take a look at some of this literature and see if there aren't a couple of lessons that could be applied early on that would not eliminate the risk, but at least minimize the risk and then especially be prepared for defense in the event that there is a serious protest by people whose opinions weigh.

Unidentified Male: Just a couple things. First of all, the Sand Creek massacre, the new Colorado History Center has an area on the Sand Creek massacre that they opened up. I've seen it, I thought it was quite, quite balanced. In recent conversations with the State historian, he can't talk out loud about it now because he's in serious negotiations with the Native community about the language that's being used in there.

But I think another aspect of this – moving in a very different direction that Alan was starting to get at – was we've got to be aware of the market that this exhibit is going live in. That we can sit around the table and be very, very wonderful, theoretical, look at all of these different ramifications. But ultimately, Museum A and Museum B and Museum C has to decide that this is something that they want to put into their temporary exhibition gallery for their audience in their community. And there's a very good example of looking at... Well, the race exhibit is a good example of bringing together outsiders to help with the definition of the exhibition.

But I think an even nicer example is [01:21:00] when the plastinated Bodies exhibit made its way to the United States. And there was great concern about what the degree that this would be accepted, the documentation of the sources of the bodies, the various religious objections to displays of the human body, these actually biologically absolutely remarkable circumstances. And Jeff Rudolph, the Director of the California Science Center, put together a committee to answer those questions in

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advance to prepare the exhibit for the US market, which is very different from the European market and the Oriental market for this particular exhibit.

And I think the model that Jeff instituted is something that we ought to be thinking about very, very carefully as we go down the line and start looking at okay, we've got all these great ideas, these wonderful controversies, these fabulous objects. How do we sell it?

Unidentified Male: [overtalking] ...exhibit on covered bridges. [laughter]

Unidentified Female: I just want to make one suggestion for, I mean, a set of material and interesting things that is not controversial but, nonetheless, I think is important, particularly because some of the controversies and debates on publics after the war were not only about fears of the blast but, again, radiation. Between 1959 and 1970, the Committee for Nuclear Information and the St. Louis Dental School put together a baby tooth survey. And so they were collecting baby teeth. You would send it in and it was a fun project for you to send in your baby teeth. They were then tracing the strontium-90 in the children's teeth and trying to make a big database, which was quite an accomplishment at that time to be able to collect that kind of data and track it, where was strontium-90 lodging in bones, what cities, other kinds of places. The Washington University archives, partly the Rosenthal collection, has wonderful materials. They have posters, there's teeth, there's all kinds of stuff there that may be usable. I don't know what those relationships are, but that might be a good one to also see how people were trying to engage public in the discovery of what was known or now known about this. So noncontroversial.

Unidentified Male: On the other side from the fear of the Enola Gay side, I'm shocked that [sound distortion] don't have the fear that I had about the atomic bomb. It's something that seems to be... they don't think about it in the same way [multiple speakers]. And I don't know what they're scared of now, I mean, my Facebook maybe or something like that. [multiple speakers] I just don't. I brought this up. Do you have any real fear about the bomb? No, we don't even think about it. It seems to me that I still carry that [sound distortion] [01:24:00] proliferation of this...

Unidentified Female: I'd just like to add another voice to the others that have spoken about this sort of preparatory preemptive education that has to go on, and I feel very strongly that that's the case, as well, in the Park Service. We can sit around, as you say, in a group like this with fellow interpreters of experience as scientists and we all agree, yes, we need multiple points of view, yes, we need to bring in outside viewpoints, yes, we needed to be proactive, yes, we need to set it within the broader context. It's not controversial to us. But when we try then to make it operational out in the field, it runs up against a wall. Not because they're bad people or they're not intelligent, but they have not had the benefit of these conversations for years like the rest of us have. We're steeped in it, so it's second nature to us. And it's important to remember that it's not the case for my Parks superintendents, that's not the case for a museum, for the museum community, and it's certainly not the case for Congress. My desk happens to be the place where all of these nasty Congressional stuff [laughter]. People will write their Congressman very upset, why are you not flying the Confederate flag over Civil War cemeteries? Why do you not include a creationism book in the bookstore at Grand Canyon? Why are you not doing this and that? I get those [laugh] and I have to respond to those.

And the thing is, the Congressmen and women are usually all on the side of their constituents. And they're telling us you're doing a terrible job, I'm going to cut your Parks funding if you don't fix

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this. And I can honestly say in every case, in ten or fifteen years now, if we pull together our information, if we can get an opportunity to sit down face-to-face with someone on the Hill and have a meeting with them and a conversation that explains the philosophy behind why we're doing what we're doing, what we're trying to achieve, in every single case – I swear – we were able to have them go, oh. It was a moment of enlightenment for them. But Kucinich, I've never had a chance to sit down with him. Hopefully, [laughter]... [multiple speakers]

Right, right. But you know, we have found it was simply a case they didn't know, and they were totally open to conversation and being educated and seeing the value of doing all the things that we're sitting around the table here saying that we should do. But if we put this more sophisticated approach and these more sophisticated exhibits out there without that preparation, we're definitely going to get that pushback. And so I've never really been in a case where we've done or considered a preemptive preparatory education program, but I sure think this is an ideal occasion to try that out.

Unidentified Male: So one thing that might be [01:27:00]... think of as you're planning an exhibition is just kind of an education of the museum staff that will present it. I mean, a formal program that you can travel with the exhibit, that it goes in in advance and actually gives the museum staff a chance to talk with people who are thinking along the lines of...

Unidentified Male: Yeah, that's very much the road for evolution exhibits in America today, that the travelling exhibits come with a "prepare your staff for the onslaught" kit.

Unidentified Female: And they certainly need it. It's so unfair because I can sit in Washington and design this wonderful curriculum or this wonderful interpretive program. And then to give it to a poor GS-9 interpreter on the front lines, they're the person who's having somebody swearing at them and calling them terrible names and stuff. We have to give them the tools how to deal with that and how to feel comfortable and to know that their agency or their museum board, whomever, will back them up, that they're not going to be left hanging. That's very important.

Unidentified Male: Listen, we're coming up to the lunch and I think we've got our reflectors and I think it would be very good to get the reflectors to reflect and we can still pursue the discussion afterwards. So Linda and Peter decide who wants to go first on this.

Linda Deck: Shall I go first?

Unidentified Female: Mm hmm.

Linda Deck: Shall I? This was very enlightening. I'm so glad we had this discussion here. I'm going to go back to what something that Art said right at the top about the power of exhibitions and how they can mean so much more – and less – than we intend. And for this topic that we just discussed, it is front and center, and it should be front and center in our concern and care and thoughtfulness on what we do here. That's what I was hearing from everyone.

Some of the salient points that I keyed in on that I just want to bring back into people's memory is we were talking about, of course, scientists and the idea of their social responsibility. But how that interacted then once it got to the engineers, and I would say that if you surveyed many of your public, they would be hard pressed to tell you the difference between a scientist and an engineer.

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Unidentified Male: Oh, you speak volumes. [laughter]

Linda Deck: And then, beyond that, once it gets into this industrial nature of the project and what that [sound cuts out] ... and that's something that definitely must be explored in this whole exploration of this topic.

What it means to be responsible – very interesting question right there. And what it meant to be responsible at [01:30:00] different times in the past and being respectful of the past. I think Richard brought this up, that we can't participate in promoting anachronisms and impose what we think today on that path. But it struck me perhaps there are real stories of social dilemmas from various times in the past that you could use as touchstones for people. And if you were going to help them explore this maybe in a more in-depth interactive, they could choose the one that they felt most akin to, that they felt they know most about like Vietnam era protests, for example. Or occupy your city. You know, so allow people to kind of get into the subject of this responsibility from something that they're understanding the content of that. Yeah, the devils are in the detail to put the content back to that.

The whole idea of the atmospheric testing trajectory sort of as a case study is a very interesting thing, especially since testing – atomic testing – is still going on today. And so it's something that was with us from the very beginning and continues today. And I have to say, I think that's one of the reasons, Art, that people today aren't more concerned with nuclear war and issues. We don't see those bombs going off anymore and we don't hear about that happening in our country. It's remote. So that, again, is to get into that subject.

There are issues today that we can, again, help people understand the past from things today. Someone brought up nanoscience, very interesting. Nanoscience, nanotechnology, and what that all means. So there are ways that we can get it. And big science, once you get it in the industrial complex, it's big science. And so the whole idea of the whole nanoscience and exploring that interesting realm, but then the technology that comes from it and what you do with it.

I love the idea of – oh – museum staff training, absolutely necessary to make sure they're understanding what's going on. The whole idea of the risk management, the market assessment, very important for this exhibit. Audience research can't begin soon enough for this exhibit, and it's ongoing. And there's so many aspects of this exhibit that we're going to be talking about. There's just so much research to do on understanding misconceptions, preconceptions, and how you're going [01:33:00] to work that into what you're doing in the exhibit.

And finally, I think exhibit designers and exhibit interpreters need to be employed in this. Probably a playwright will need to be employed [laughter] because that idea that Alan brought up of engaging people with something really serious to explore some of these issues with, people who can actually play with veracity the roles that were going on. So that you can sit there and you can develop in your idea from those really rigorous performances, that's a great idea.

Unidentified Female: Alright, thank you. Welcome.

Peter Kuznick: Thanks. I guess I come at this from a somewhat different perspective as a historian rather than somebody who works on exhibits. I've been involved with some exhibits back when I was, when Art was my advisor and I said... post doc at the Smithsonian, we were...

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Art Molella: He was just a little kid at that time. [laughter]

Peter Kuznick: With that planning, what later turns to be the Enola Gay exhibit, it's the first attempt at dealing with that for the fortieth anniversary. [Interruption] That's Stanley Goldberg. Then I got involved in 1995 when the Enola Gay exhibit got cancelled because we had just started my Nuclear Studies Institute at American University and we did the Hiroshima Nagasaki, it was the only exhibit outside of that year on the fiftieth anniversary, and had those artifacts there. The infamous [01:34:35] has never left Japan since then. And in 2004, I led the protest against the new Enola Gay exhibit at the Udvar-Hazy so I thought that was obscene to present it that way.

But as an historian, I look at it in the context well, then, we'll have to deal with all this, is the whole history of American militarism not only beginning at this point but extending throughout part of the subsequent period at the United States. We don't know the exact figures but Christopher Hellman from the National Priorities Project estimated in 2011 that if you take our military spending, our intelligence, and our national security, it comes to 1.2 trillion dollars, which is about equivalent to what the rest of the world spends. And so I can't get that out of my head when I think of the context within which we're looking at these issues. And the standpoint that Obama had in his Pride speech in May of 2009 when he calls for nuclear abolition, he says we have to take the lead. We have a special responsibility because we are the only country who has actually used nuclear weapons in wartime. So that context, I think, has to permeate this.

But when I look at how to deal with some of these issues, I think context is very important. And the scientists, when dealing with the moral responsibility of scientists, they didn't come at this as virgins in the 1940s. [01:36:00] If you look at that in the 1930s – I wrote a book about this – let me just start with a statement that Reed Thane [PH], a sociologist, made in 1933. He said, "Scientists, with two notable exceptions, are the worst citizens of the Republic. They, more than any other single factor, threaten the persistence of Western culture. They produce powerful mechanisms and proudly proclaim that they don't care how they're used, leave that to the moralists. If a man of science tries apathy to promote what seems to be the good life, his fellow scientists will look askance, lift the eyebrow in scorn, and read him out of the party. He becomes an outcast, renegade, pariah to the cult. One of this unwritten laws is that no true scientist is directly concerned with human welfare. You're advocating something? You call that scientific? In short, the American scientist lacks moral courage, has no integrated social philosophy, has tremendous self-complacency and egoistic smugness, feels no social obligation or community responsibility, is provincial minded, and so highly specialized that he's almost psychopathic." [laughter]

Unidentified Male: What did he really think?

Peter Kuznick: And that was the sense about the scientists at that time. Like the scientists changed dramatically, more profoundly than any other group in society in the 1930s. The sciences society movement dominates the scientists, they become racked with guilt and concern and ideas of social responsibility. And the AAAS election for President December 1938, the five top vote getters were all the leaders of the science and society movement, they were all on the left. There was Arthur Holly Compton, who's the head of the American Association of Scientific Workers, which is a very radical group. He was the head of the Chicago Branch. AJ Carlson, Harold Urey, Walter Cannon, and Gilbert Lewis. And Walter Cannon gets elected President of the AAAS and for 1939, he's the leading antifascist, he's an outspoken socialist, lots of collaboration with the Soviet Union. So the

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scientific community comes into the Manhattan Project with a highly developed sense of politics and social responsibility at that point.

The Manhattan Project gets complicated and that's why we have to understand it. Part of the reason why the scientists flocked to the Manhattan Project is because they were so strongly antifascist. The scientists led the antifascist movement in the United States in the late 1930s. So they were obviously attracted because they were concerned about that they're getting involved with that would represent.

But even within the context of understanding the Manhattan Project, some of the moral issues we have to raise with the scientists, Richard had said before that the issue of the atomic bomb was already decided with the advent of strategic bombing. I've got some concerns about that statement because there's something fundamentally different that the scientists understood. It was in 1942 that Edward Teller starts talking about the super bomb and he starts talking about the hydrogen bomb in 1942. It was in May 31 of 1945, Robert [01:39:00] Oppenheimer briefs the interim committee and says within two to three years, we'll likely have bombs between ten and a hundred megatons in destructive capability. So we're talking seven thousand times, potentially, the size of the Hiroshima bomb, and people died. When Harry Truman was briefed on the atomic bomb for the first time on April 13 by Jimmy Burns, he says it's not a bigger weapon. It's a weapon that's great enough to destroy the whole world. When he got briefed on April 25 by Stimson and Groves, he says the same thing again, that maybe we shouldn't use it if we can develop it because we can end life on the planet. When he gets briefed on how successful the Alamogordo test was on July 25 at Potsdam, he says this may be the fire destruction prophesy that Euphrates Valley era after Noah and his fabulous ark.

So we're not dealing with a bigger, more powerful bomb. We make these decisions in the context of knowing that we're beginning a process that could end life on the planet which, to me, is a very different kind of moral responsibility and some of the scientists got it. And some of them, Szilard and the others, were raising this kind of concern.

And then, after the war, Einstein and the others, that was what motivated them. The interesting thing to me is how differently the scientists, the physicists responded to the atomic bombing and the chemists responded to the use of chemical warfare after World War I. The chemists were opposed to any attempt to limit use of chemical warfare and poison gas. The scientists, the physicists were the forefront of efforts for international control.

But this develops through this period and as Kelly was talking about, the question of the Committee for Nuclear Information out of St. Louis, this doesn't happen by accident. What happens is Arthur Holly Compton becomes the Chancellor of Washington University and he brings in blacklisted scientists, scientists who are very political – EU Condon, Barry Commoner, (inaudible) [01:40:50] and others. And there's a continuation of social and moral responsibility among the scientists throughout this period on a lot of issues – in post McCarthyism, in nuclear testing. But then that continues. And it's interesting that the AAAS, the scientists are the first group opposing the Vietnam War ahead of any other organization. They're on record opposing the war in December of 1965 when Carl (inaudible) [01:41:19] was going to give his NLA speech in 1968, and he writes Commoner and says, "Tell me why the physical scientists were so far ahead of the humanists and the social scientists. Why did you get this?" And again, the question of context becomes so relevant because this is an ongoing debate, a discussion in this course among the scientists, even when

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during the somnambulant 1950s, when everybody else was hiding under their beds, the scientists were out there in the forefront of this kind of political activism.

So I think even though the issues become complicated during the Manhattan Project, I think they have to be raised. And I like the controversy. I'm going around the country speaking [01:42:00] about the decision to drop the bomb. The audience is anywhere between five hundred and three thousand, and we're getting a great response and people are very interested still, even though they don't have a lot of knowledge of this, they are getting it.

The other group I work with is the Atomic Bomb Museum in Hiroshima. I take students to Hiroshima and Nagasaki every summer since 1995 and we spend a lot of time at the museums. As you know, they've got an institution in Japan that we don't have in the United States, it's called Peace Museums, which have a very conscious bias. And if you go to the museums – the A-Bomb Museum in Hiroshima, which I work with, or the A-Bomb Museum in Nagasaki, which is actually much more effective – you get to see some of these methods of presentation of moral issues, as well as social consequences. And from my standpoint as a historian, I think these are key things that we can size, that we have to take on directly.

Unidentified Male: Thanks.

Unidentified Male: It's interesting on the scientists deciding no, we shouldn't drop the bomb and pushing for it, that that generally came after Hitler's defeat. Up until the point that Hitler was still in play, they were very much for it, which raises some very different questions that are totally sociopolitical.

Unidentified Male: Well, one of the stories, he's talked about this, but my understanding was that had to do with the perception that the Germans were further along than they were, and the matching perception that the Japanese were further behind than they were. So they're probably both true, although I don't know anything about the Japanese program. I think there was a program that got...

Unidentified Male: It was not well developed.

Unidentified Male: Yeah, okay.

Unidentified Male: The Germans abandoned it in 1942. If we find that out in November of 1944.

Unidentified Male: And then you could look and see what you believe about Heisenberg.

Unidentified Male: Heisenberg, yeah.

Unidentified Male: Who has the play now about Fawn Hall based on the Fawn Hall transcripts?

Unidentified Male: You mean the Farm Hall?

Unidentified Male: Farm Hall.

Unidentified Male: Farm Hall.

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Unidentified Male: I haven't seen that. Has anyone seen it?

Unidentified Male: I've seen it. Yeah, no, I mean, by the time of September, October, November of 1944, Groves and everybody knew that there was no German program so it's over. The pacing item here is the production of material – how much HEU will be ready when? How much plutonium will be ready when? That was it. When there was enough – and coincidentally, it almost happened on the same day – the bombs were ready and they were immediately used. So everyone knew the war was going to be over in Europe by April, May, sometime in there, and it was over on May 7. So [01:45:00] Japan became the focus of attention to end the Pacific War. That was a strategic decision from on high, from FDR and others. And the German program was out of the picture early on, although Groves was obsessed with it until he had absolute confirmation by – we can pin down almost the exact date when Sam Goudsmit and Boris Pash tell him no program, nothing serious. Don't worry about it, and he was convinced.

Unidentified Male: In his report to the President in April, did Groves, I think, not write the target, it was always intended to be Japan's [inaudible] to that effect.

Unidentified Male: I don't think that. Somebody just raised a good question about whether or not the war had gone on further in Europe and whether the bomb might've been used against Germany. And I happen to think that it would've been, and it was just a matter of the circumstances on the ground in which the armies were moving and that the war was over, and it ended up being Japan. So it had the war going on and if it wasn't over in May and they'd gone on June, July, August, September – which is impossible to conceive because of what was happening on the ground – would the bomb have been used in Europe? And yes, I believe it would've been. And Groves was sort of the main engineer of the locomotive that was going so fast down the track that no one – not every Truman – could stop it.

Unidentified Male: Maybe essential not Truman.

[Multiple speakers]

Unidentified Male: ...sort of delivered a fashion of pros and cons. Truman just got out of the way and let the momentum go forward, which it did. And the only decision he could've made would've been to stop the thing. And having him thrust into presidency in mid-April with people like Stimson and Marshall around him, it was impossible that he was going to say no, don't do it. Let's go with it and they had him.

Unidentified Female: Well, just before we go further, were you about to conclude?

Unidentified Male: Oh, yes. [laughter]

Unidentified Male: It is lunch, I suppose.

Unidentified Female: Yes, there's lunch, and I want to thank everyone for an excellent presentation and the discussion we've had. We, fortunately, can continue this because at 1:30, we begin to look at the decisions about the bomb. Perfect. Any rate, enjoy lunch.



**Presentation: The Decision to Drop the Bomb by Richard Rhodes, J. Samuel Walker, and J. Newlin**

Richard Rhodes: A couple of things I just wanted to throw into the discussion quickly from a previous discussion. Something Oppenheimer said after the war on this question was science versus engineering: He said, and I suppose he said it with a little edge, “We didn’t do any physics between 1939 and 1945,” and I think with the exception perhaps of measuring cross sections, that is just about true. It was a massive engineering project.

Then the other comment between—it’s something that I’ve always treasured that Shelby Foote once said in his books about the American Civil War, that “it takes a hundred years before you can write objectively about a war”. I think we are just about coming up on that mark, so maybe we will have a chance to move ahead. For me, the problem of the decision to drop the bomb has always turned again on this question of anachronism and historical writing, the historical discussion. I know plenty of people, as I am sure many of you do, who were involved in training for the invasion of Japan, will say thank God for the atomic bomb. One of those people, who I particularly cherish knowing, was the actor Paul Newman who was the bombardier on a two-man Navy plane training for the invasion. He told me, after I was saying something about using the bomb, he said, well, I was one of those guys who said thank God, because I got to go home in one piece.

There is that side of the story. Whether or not the bomb was the decisive event; or as I think we now understand, was one of the decisive events that contributed to the Japanese decision to surrender. I just learned that minutes ago, by the way. I had thought that Hasegawa’s book basically said that it was the decision of the Soviet Union to invade that left the Japanese aware that they were surrounded on two sides by large and powerful armies, but led to the decision by the Japanese military to agree to unconditional surrender. Evidently, what Hasegawa in fact says is that the bomb was one part of that story, which moves us, we can assume for the moment that that research is decisive. Which moves us, I think, to part two of the argument about the use of the bomb, and that is was it simply dropped to scare the Russians; which I have always found a rather pernicious argument, frankly. When you look at the records of what Truman was thinking, when you look at what George Marshall had to say after the war [00:03:00] about the American fury that the Japanese would not surrender when by all conventional terms of war fighting, they had lost. They were down to about a thousand calories per person of buckwheat and weeds per person, and in Japan. They were without an air force. They were without a Navy. Their home islands had been blockaded. There was just simply no reason for them to continue fighting from a western point of view. But it was a more intimate part of Japanese culture, perhaps, that led... Well, it was the Japanese military leadership that didn’t care how many civilians got killed along the way, if truth be told, that led them to hope that when the invasion inevitably came, there would be enough bleeding of American forces that the United States would soften its position about unconditional surrender.

If there was a concern on the part of the United States military about the Soviet influence in Japan after the war, I have a feeling that that was reflected in the fact that the Air Force conducted its most intense bombing campaign on the fourteenth of August in northern Japan where the Soviet forces... That was the direction the Soviet forces were moving, down from Sakhalinsk down to Hokkaido, which sounds to me like a bit of warning to those forces. I understand some fighting went on in northern Japan until something like August 29, just before the actual surrender ceremony. We were concerned did we not have a situation like in Japan like the situation in Germany, of a divided country, half Soviet, and half Western. That said, I frankly do not believe from the record that I

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have seen that the U.S. military was thinking about how the Soviets would respond. I think the U.S. military was thinking about how to get this damned war over and stop killing people. And, if truth be told, we saved a lot of Japanese lives too by ending the war when we did.

How you tell this story, when the pervasive story has become today... you know school children have a module that they go through of the impeachment hearing, the impeachment trial of Harry Truman, over his decision to drop the bomb, and I think Truman usually loses the impeachment trial and is impeached in those. That is sad to me, not because it is necessarily wrong, but because it is so totally a-historical, in terms of what was actually going on. It seems [00:06:00] to me that there's a real opportunity here to present this information without necessarily taking sides, but to present all of the variety of elements that went into that intense, final month after month of the war around the atomic bombings that could easily call on all sorts of resources in an exhibit like this. And yet, as we have all talked, I'm sorry, I'm going on, but I'll stop in a moment... As we have all talked, a lot of these subjects that we have discussed present themselves beautifully as kind of modules where there are specific artifacts, specific testimonies, specific documents, that can be brought together to make a presentation that would be, as it were, a sub-module of this larger module that we are discussing. A lot of history could be covered that way in a really objective way by basically letting the people visiting the museum have the same kind of experience that those of us who are historians have. Confronting the raw material, confronting the documents and the images in the film and the letters and so forth, and get a sense of how you do that. Get a sense of just how really difficult it is to pull out of all of those diverse perspectives, some kind of coherent sense of what actually happened.

If there is one subject that has engaged people since the end of the Second World War, it is certainly the decision to drop the bomb. At another level, this was the basic and definitive atomic bombing, and the only atomic bombing in anger that has ever happened, and there is an interesting question to ask about why we were able to do that then, and why no one has evidently felt able to do it since. It gets to the heart of the whole issue of deterrence. Not necessarily formal strategic deterrence, but elemental existential deterrence of the kind Niels Bohr was talking about. That is, I think, fundamental to the change in our relationship with the natural world that Bohr talked about as the thing that had happened as a result. The development, the discovery of this way to release nuclear energy, so as seems to be so often true, when you look at any piece of history, you can dig really, really deep if you just use your imagination a bit. We are lucky enough to have the right kind of documents and materials too, that is important, and get down to some very basic issues about war and peace and about science and how it works in the world. [00:09:00]

This program, this particular event, also lends itself beautifully to dramatization, debates among the various positions, to the testimony of eyewitnesses, either documents or alive, or video. All of that is there around the subject and it's still very much is a live subject, so I see this as kind of the paradigmatic example of what kind of exhibit we could be doing. When you think about this as the fundamental problem that came up about the Enola Gay, it is really exciting to think there might be another way into the story, that might make it possible for people to actually think about it instead of being emotionally blocked by the very strong feelings about it.

J. Samuel Walker: Okay, I am up. All right, it is apparent that any exhibit deals with the Manhattan Project, has to do with the question of the use of the atomic bombs against Japan. It is also obvious, I think, that any discussion of this extremely controversial subject has to reflect current scholarship, which is exactly what the curators at the Air and Space Museum did in the early

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1990s when they were planning the ill-fated Enola Gay exhibits. So, the question is, and Richard just mentioned it, how do we approach this extremely controversial, extremely emotional issue, in a way to avoid the questions or the comments and the outrage that followed the publication of the draft script of the Enola Gay exhibit. This whole question, of course, is made even more difficult by the fact that the controversy swirls around counterfactuals. Most of the questions that arouse so much debate and so much controversy, and indeed, so much ill will amongst scholars, as well as apparently the general public, is based on counterfactuals. How long would the war have gone on? Did we have to use the bomb? What would have happened if the bomb had not been used? How long would the war have gone on? Would an invasion have been necessary? If an invasion had been necessary, how many casualties would have it exacted? How many lives were saved, American and Japanese, by the use of the bomb, if any? All of these questions are extremely important. They are extremely emotional and they are basically questions that can't be answered because they are counter-factual.

What I want to do in my time this afternoon is to talk briefly about the current state of the literature, because I am [00:12:00] convinced that that is a necessary part of planning any exhibit on Truman's decision or non-decision. Truman's action in authorizing the use of atomic bombs against Japan, and basically this controversy is centered on one question. That question is was use of the bomb necessary to end the war on terms that are satisfactory to the United States. There are two basic answers that have been given. This is a very polarized controversy as you know, and the two basic poles are on the one side, I guess I should put it on the right side here, my right, is... This is the one that those of us of a certain age grew up with as revealed fact, and that is the use of the bomb was absolutely necessary because the only alternative, the only alternative was an invasion of the Japanese mainland that was going to take hundreds and thousands of American lives.

The other pole of the debate, and I will use my left hand here, is that no, that is wrong. The bomb was not necessary; Japan was on the verge of surrender. Japan was trying desperately to surrender on the sole basis that the emperor be allowed to remain on his throne, presumably as a constitutional monarch and that Truman used the bomb, not because it was any military necessity, but for other reasons. The reason that is given most often is that he used it to impress and to intimidate the Soviets in the emerging Cold War.

Those are the poles of the debate and those are basically the issue around which the debate has been carried on by scholars. There are fundamental problems with both of these interpretations. The traditional view that Truman used the bomb because it was the only alternative to an invasion that would have caused hundreds of thousands of American... sometimes Truman and others say casualties, sometimes they say deaths, but huge numbers, totally unacceptable numbers and there's a couple of major flaws with that approach. One is that there were other ways that the war could have ended; there are other ways that the war would probably have ended. The invasion was not scheduled until November 1, 1945, just about three months after the bombing of Hiroshima and in that time there were many other ways in which the war might have ended, and in my mind probably would have ended. So, it wasn't a question of using the bomb in August versus authorizing an invasion in November that would have been absolutely necessary. It is clear from the sources that when Truman's top advisors talked about the invasion and it was something that they wanted to avoid. It was a horrible prospect to have to invade the Japanese [00:15:00] mainland, but they talked about it in conditional terms. If the invasion becomes necessary, if we have to invade Japan, if such and such happens and we have to invade... it was always conditional. No one ever thought it was inevitable.

So that's a major flaw with the traditional view along with the fact that they... that not only don't they recognize the fact, or acknowledge the fact that there were other ways the war could well have ended, but they don't try to explain why the use of the bomb was the most appealing alternative. And there were reasons for that. The other alternatives all had severe drawbacks and the bomb seemed, in many ways, to be an ideal solution because it did not have the drawbacks of the other ways in which the war could well end.

The other problem with the traditional view is that there is no evidence... and there is a whole lot of controversy about this issue, the issue of casualty estimates. There is no evidence that I have ever seen, no convincing evidence that I have seen, that Truman was ever told that if he had to authorize an invasion of Kyushu, starting around November 1, 1945. The worst case, it would cost hundreds of thousands of American casualties or deaths. He was told numbers that were much smaller than that, but there is no evidence that he was ever presented by his advisors that... and again, as we talked about this morning, Truman was heavily dependent on what he heard from his senior advisors, and especially his most trusted advisors. There is no evidence that they ever told him, Mr. President, you have a stark choice between authorizing the bomb; or authorizing an invasion that's going to cost hundreds of thousands of American lives. It just did not happen that way, and frankly, it astonishes me that there are still some scholars who insist that is that case. The evidence and what we know about conditions in Washington, as well as in Tokyo, I think make it clear beyond doubt that this was not the case.

There is also, what I view as major flaws in the revisionist position. First and we now have a lot more Japanese sources than we had before the Emperor died in the late 1980s. And scholars who are able to use the Japanese sources, and these were not scholars who were necessarily, or in any way supportive of the use of the bomb or fans of Harry Truman, but they have concluded from Japanese sources that the Japanese were not ready to surrender. They had not decided to surrender, that the Japanese had not reached a point where they had decided to surrender. [00:18:00] And that knocks out a major crutch of the revisionist position because it's based on the argument that the Japanese were trying to surrender. The Japanese sources, and from what we know of other sources, indicates that simply was not the case. Scholars who have used Japanese sources also indicate that even if we had offered to guarantee the status of the emperor, even if we had made a statement to Japan and a Potsdam Proclamation or some other context, we are going to allow the emperor to remain, that this would have convinced the Japanese to surrender. That again has been a major part of the revisionist argument. If only we had assured the Japanese that they could keep the emperor, then Japan would have surrendered. Japanese sources seem to indicate otherwise. Furthermore, the Japanese, up until the time that they actually surrendered, when they talked about retaining the emperor they did not talk about retaining the emperor as a friendly, constitutional monarch.

When this issue was discussed within the Japanese cabinet, and among Japanese officials, when they talked about retaining the emperor, what they talked about, or what they thought about, and this includes the emperor himself, was to keep the emperor as a divine ruler. This of course, was totally unacceptable to the U.S. or anyone else who was aligned with the United States in trying to end the war. So, everybody wanted to end the war, that was the first priority, but not on conditions that were unacceptable. It is also clear from the sources, that Truman and his advisors did not believe that the Japanese were ready to surrender. There are many sources, but the most clear is a memo from General John Weckerling [PH] who was Marshall's chief intelligence officer, who addresses this issue and said there is just no evidence the Japanese are ready to surrender. That it

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would be nice if there were such evidence, but there is no evidence whatsoever that the emperor has decided the war must end on conditions that are acceptable to us.

Both of these polar interpretations, I think, are seriously flawed and the state of scholarship now, and I am talking about books that have been written in the last ten or fifteen years, have come out somewhere in between. The question then becomes, where in between? And that varies a whole lot. There are still lots of questions that are debated among scholars. Certainly, [00:21:00] at least to my knowledge, there is no consensus on many secondary issues, but there are on the main issues, and that is that the bomb was necessary to end the war as quickly as possible, that the Soviet invasion was also a major influence. The bomb and the Soviet invasion combined were essential to force the Japanese to surrender promptly after August 6 and after August 9. Many other issues are still subjects of sharp debate; some, such as the relative influence of the bomb versus the Soviet invasion, the impact, if any, of the bombing of Nagasaki; and the casualty issue. There are lots to argue about, but I think in terms of planning for exhibits; in terms of trying to get the scholarship right, I think it is important to realize that this issue is very controversial and it is very emotional. The scholars, and I'm talking about really good scholars who's work I have a great deal of respect for, may come out somewhere in between. Even better, the decibel level of the debate has been reduced to reasonable proportions. I think that's all good and maybe by the time... the new exhibit, this exhibit is ready, maybe we will have reached a point where we can talk about these issues and disagree, but do it in a civilized way. If we can do that, then that is major progress. Thank you.

J. Newlin: I am going to talk about three tactical approaches to controversy; and in the context of three exhibits, which I picked out of the air as having had some effect on me. One you have heard of, which is understanding race, or rather race, are we so different, which was done by the American Anthropological Association, developed, and produced by the Science Museum of Minnesota. The first one I would like to talk about is wolves and humans, which was done also by Minnesota back in eighty-five. At the time when there was very big discussions about whether [00:24:00] wolves should be reintroduced to the northern states. It was extremely controversial at the time. Of course, the Twin Cities, very liberal and environmental, was all in favor of this restoring of nature and the people up on the north, the people who were the farmers and the hunters and what not, were really opposed to it. we were able to develop an exhibition that allowed every... that allowed both sides to speak, in this case through the videos, and then allow people to react to those speeches.

Later on, when people ask, how did the exhibit work for people, we heard from both sides that they liked the way their side was presented in the exhibit. They may not have agreed with everything. I think the tactic here with controversy, is to try to avoid the museum voice. So often museums present, or tend to present everything as kind of from on high. This is the way it was and they use all of their authority and their formal language to do that. Whereas with something like the decision to drop the bomb, I think we need to let people who were arguing it, speak for themselves. It was really about what you were saying, Richard; to try to confront people with the sources, the sources of history. In as much as possible, let people speak for themselves.

The second exhibit is from the National Museum of American History. It was done in eighty-seven, called A More Perfect Union, which was about the Japanese-American internment, also in World War II. In Thirty-nine... actually, in forty-one, right after Pearl Harbor, Roosevelt signed an order to remove everybody from the western states of Japanese descent. These were Americans, many second generation or more, removed to internment camps in the mid-west. This, I think, and

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eventually, I think after this exhibit, there was an apology, actually given by President Ford. Maybe I was right, but it was before the exhibit was done, there was an apology given to the Japanese citizens. Obviously, it was a terrible thing [00:27:00] for many people because they were forced to sell all their possessions at substantial losses and there were some reparations too, but it's not... I have a good friend who was actually born into one of these camps and his parents were forced to work... who were merchants on the west coast... were forced to work in the truck farm in New Jersey. To get out of the camp, they had to do this.

I felt that the exhibition was extremely powerful, and because it let people talk with their own words, that it gave the stories... it gave the individuals... and their own pictures of the camps, pictures and stories of what went on there, artifacts, and then at the same time, it really talked about the Supreme Court negotiations... I guess not to be a real decision from the Supreme Court other than well; we are not going to interfere right now. And it never got up to be a full decision, I think. Even at the end, because of deaths and settlements and things like that. But a very powerful technique.

Race we mentioned... you've mentioned a couple of times... I think of exhibits in a Dewey sense, you know education isn't something you pour into somebody, right? Education has to be a transaction between a teacher and a learner, or between two learners, that involves I think, change on both sides to be really meaningful. In the Race exhibit, we used a technique called Talking Circles, which was used... after people went through the exhibit, we would get about twenty people with a facilitator, to sit around in a circle and use a rule that you pass the talisman and only the talisman person got to speak. I think we did not actually do that, but one person speaking at a time, to talk about their own reactions to the exhibit and what race really was. This became extremely difficult to do, because it is staff intensive. We paid these presenters, it was in demand, it required lots of logistics for managing space, but we had companies from in Minnesota, when it was at our place, we had companies who would send their employees there to go through the exhibit and then go through this talking [00:30:00] circle experience so they could reflect together. I think that means... when I say it's transactive, it means that it wasn't the presenter really giving a point of view, as it was people exchanging point of views and... points of view, and interacting with each other.

I think in this kind of thing we have to figure a way in an exhibit about dropping the bomb, we have to figure a way where we can let people who are engaged in trying to understand this, interact with each other and hopefully, maybe find a way of leaving something of themselves, of their process, with the exhibit for others to take.

Richard Rhodes: Comments, going back to the question of using the bomb, I think it's really important that the issue of strategic bombing that precedes the decision to use the bomb, is somehow incorporated into this debate and this module. Hiroshima and Nagasaki would already have been destroyed. They were deliberately taken off the target lists, along with several other Japanese potential targets, in order to preserve them for atomic bombing, so that we could study the effects of these bombs, which had never been dropped on occupied places before. So, if you... speaking of counterfactuals, if you say we didn't have any atomic bombs in time, and we knew that by the summer of forty-four, they would simply have already been destroyed by Curtis LeMay and his B-29s. what does that say about the whole debate? It merely raises some very interesting questions. And perhaps more to the point, maybe more relevant for an exhibitor, it's very important, not only to the dropping of the bombs, but also to the subsequent history of nuclear weapons. These

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bombs were not more destructive than the equivalent firebombing campaigns that had preceded them. The most destructive attack on Japan wasn't Hiroshima or Nagasaki, it was the first big firebombing of Tokyo in, I think, April of forty-five, when at least a hundred and fifty thousand people died, and there are estimates of casualties up around the half-million mark. I mean, seriously injured [00:33:00] casualties. Or, you can look, of course, at Dresden or Hamburg, or the cities in Europe.

The bomb was deliberately designed to explode high enough in the air, deliberately triggered to explode high enough in the air that it would not churn up soil with its fireball and make a lot of radioactivity. The assumption was that the prompt radioactivity of the fireball would kill people who would have been killed by a blast anyway. Whether it actually worked out quite that way, I do not think it did, but the point is, there was every effort made to make this bomb as conventional in its effects as possible. Which tells you again, the general thinking that this, from a military point of view, is just another weapon of war, which is kind of I think what President Truman was doing when he really never quite decided to use it. He just released it for the military's use and any subsequent weapons of its type.

There is, at the other extreme, the fact that there were discussions between Robert Oppenheimer and General Groves, of ways to make a lot of bombs quickly by making composite cores and whatever. I saw a memo from Oppenheimer to Groves saying with composite plutonium and uranium cores in an implosion weapon. We could have six per month by October. Imagine how we'd be thinking about that debate if that had happened. It is pretty clear that we were going to substitute atomic bombing in the classic air tradition of using strategic bombing to replace troops on the ground as a way of preventing the invasion, and as a way of forcing the Japanese either to surrender or die, I suppose.

I guess it would work for modern museum visitors to sit down and talk about these issues. I hope they would be adequately prepared because it is so, if you will, alien to our very peaceful... relatively peaceful world, where most young people do not even think about nuclear weapons. A lot of Americans think we got rid of all our nuclear weapons at the end of the cold war. Logically enough, we should have, but we did not. I do not know how people would handle this issue. I think the exhibit will have to somehow prepare them to have this discussion in a meaningful context of endless loss of lives of our troops and their troops and the death and death and death until we were just fed up and ready to do whatever we needed to do to put an end to this God-awful war.

There is a famous discussion [00:36:00] that went on between Jimmy Burns, the Secretary of State, and Harry Truman, two good southern politicians. Burns saying to Truman, "Mr. President, what will you say at your impeachment trial when they ask you why, when you had a weapon that might have ended the war and saved American lives, you chose not to use it?" I am sure that was an important influence on Truman. That was a political issue. That was a personal issue.

Unidentified Male: Yeah, I might add to that. In Truman's mind, he did not have to be told in August 1945 that the bomb would save hundreds of thousands of American lives. If Truman had been told, as he probably was, it was going to save American lives; that is all that mattered. It did not matter if it was a hundred thousand, three hundred thousand, or fifty. I am convinced that if somebody had asked, or said Mr. President, you can either use the bomb or sacrifice an extra half-dozen American lives, he would have said, "Yeah, the bomb."

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Unidentified Male: Absolutely.

Unidentified Male: It would have been a very, very low number, I mean as counter-factual to the extreme, to speculate, but that was his concern and he didn't have to be told that the bomb would save hundreds of thousands of lives. That was something that came later and there is just no evidence to support the claim that he was told the bomb would save hundreds of thousands of lives.

Unidentified Male: I would just add to that. I have spoken with Japanese who were around at that time, who said thank God for the atomic bomb. Who said a lot more of us would have died had you not dropped those weapons. I do not think they were just being polite. I think they had a sense too that their military leadership was prepared to sacrifice as many civilians as necessary to reach the terms they hoped they could reach with the United States.

That raises another question that we have not discussed at all in any context today, but I want to raise it just because it's... bucket of worms though it is... it is an interesting question. Is there a way to bring the Japanese into this exhibit? They are a part of the story too.

Unidentified Male: You only have to visit Hiroshima on August 6, you realize how much this whole event meant to them as well. It's an extraordinary experience to stand in the peace park when the entire city just stops for one minute while the bells ring and streetcars stop and cars stop and everything stops and then they release the thousand pigeons and life goes on, but I don't know what to say about that except that's theirs, sitting on the table...

Unidentified Male: That's of course a major issue for the [00:39:00] Enola Gay because they did bring in the Japanese and that was a real strike against that.

Unidentified Male: Right. Well, I am sure it was... but you know, no official talk of an American representative has ever attended the peace ceremonies...

Unidentified Male: The ambassador has.

Unidentified Male: Ambassador has? Oh good. Good. I know we are inching our way towards dealing with that, but somehow to include that would be a step in the right direction; if it does not crash the whole project. That is the problem.

Unidentified Female: One of the things that Sam said that sparked a thought in me is for the exhibit. When you have these two polar opposites in the debate, is language. The language of the exhibit is going to have to be very careful, so that you are not feeding into those nets and into those counter-factual arguments. You have to be very careful about the language that you are going to use.

One of the things that we try to do in our museum is let the people who were there tell the story. That is how I think you can bring in maybe some of the Japanese. We have pictures of the destruction of Hiroshima, but they are very sanitary. You do not see any bodies or anything like that, just the buildings. But we also have this wonderful book from Phillip Morris, one of the scientists, saying maybe because of what we have seen, this will never have to happen again. And that's really powerful to people. People do resonate with that. It is like, yeah, that was terrible and



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gosh its good we haven't had to do it again, isn't that great. So language I think could be a real key in keeping the controversy from becoming like it was in Vietnam.

Unidentified Male: Along those lines, it may not be relevant for any exhibit, but had bombs not been used, would be ready in time for a more horrific use later.

Unidentified Male: Another counter-factual.

Unidentified Male: Where in Korea would it have been dropped?

Unidentified Male: Well, [Dead Spot] [00:41:11] working in that direction.

Unidentified Male: Can I offer some push back on one thing? I certainly agree that presenting, if you have multiple sides of an issue, and you present—let each side present its view in its own words, you will diffuse a significant part, if not all of future controversy. But the notion that the presenting organization has to be completely neutral, and not let its own expertise be heard, bothers me. I would think that we can say some things like the overwhelming consensus [00:42:00] of the scholars who studied this is that this we know is accurate. The following conjectures are not accurate. And here are the areas where there's still legitimate uncertainty and ambiguity for which future scholars should hopefully help resolve. I think we do have to take some stands on this. It is a little clearer when we are talking about things like evolution, where within the scientific community there is no serious disagreement, and then we just come out and say it. No, evolution really is the way everything we see and study tells us the world works. Not so simple in something like the Manhattan Project, the decision to drop the bomb, but still I think it's dangerous to say we have to step back and simply be the physical space in which the debate happens and not play a moderating role ourselves. I think that has its own dangers in it.

Unidentified Male: I think what Alex said about the diminishing proportion of the population that has any kind of contact through family, through personal experience, makes it necessary for the exhibit to lay these things out in a way that is not completely ambiguous.

Unidentified Male: I would say that we need, however Alan, to do it in the voices of the historians. In other words, rather than museum voice, to try to say well, this consensus of the people we have read to the latest issues, this is the way it seems to us.

Unidentified Male: You know, there is a problem with that... excuse me, let me just... and then I will get back to you... Charles I know has... the problem with that is that, and I am a flaming moderate on this issue... [Laughter] that is clear from what I said earlier, but as scholars, you know, I used to work for the government and so those scholars toward the left pole, or on the left pole called me a conservative official historian carrying the party line. Those scholars, and I think that is the right term, but those scholars on the right side of the issue, who took the traditional view, called me a left-winger. So, if you try to leave it to the voice of historians, and I'm not alone in this, I'm not saying that I'm a martyr. I'm just saying that's the nature of the debate [00:45:00] and the best hopes we have are time and the tenor of the debate is, in my mind, improving dramatically and has over the past ten years, because a whole lot of really good work has been done. Having said that, I will say that still I think, and I do not base this on anything other than my own impression, is still the deeply ingrained view of most people who think about this topic, that Truman had to use the

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bomb because the only alternative was invasion that was going to cost a million American lives. I am not sure how you deal with that, but I think you have to be aware of it.

Unidentified Male: Does anybody know, just to throw this out, what the latest public polling statistics it is? Because I have seen some a few years ago, I think in 2008 they did another poll on American views on the atomic bomb, and it was about fifty-fifty.

Unidentified Male: A more recent poll was more in favor of the bomb than opposed, except younger people were more opposed to the bomb than the older people that were more in favor of the atomic bomb. Women and younger people, up to age thirty, were more opposed to the bomb.

Unidentified Female: How does that compare with gun control?

[Laughter]

Unidentified Female: I think one of the things you have to be careful with when you are talking about saying what the scholars determine is that you have this experience. Robert and I were talking about it earlier, of the men who were on the troop ships that were headed for the invasion. You cannot tell me that they did not have the experience of they were told they were going to die. They were told their companions were going to die. They did not have to once the bomb fell; and that is a very, very powerful experience that no matter what the scholarship says, you cannot take that away from them. That is why it was so emotional I think for the veterans during the Enola Gay controversy, because somebody was telling them whatever you experience, was not reality; and I don't think you can do that to that many millions of people.

Unidentified Male: There is another party we have not heard from on this at all and that was our friendly generals in the Army Air Corps, or the Air Force who were very much enthused about the efficiency of this whole thing. If you had to launch a thousand airplanes, probably three or four of them were not going to get off Tinian and Saipan. If you had to launch four, your odds were pretty good, and if you could do the same thing with four air crews and four airplanes, even with a spare, that's the way to go.

Unidentified Male: Actually, the Air Force generals were more concerned that the atomic bomb was going to make their thousand bombers obsolete.

[Laughter]

Unidentified Male: The ones in the Pacific were not thinking that way, [00:48:00] the ones here would.

Unidentified Male: Just a couple of things, I think it is important to make a distinction between defeat and surrender. General Groves makes this point. He says that, General Robert E. Lee was defeated after Gettysburg, but it took another eighteen months until the confederacy surrendered. Likewise, the Japanese were probably defeated after Midway, or wherever you want early on; but it took something else for them to surrender. So, there is a distinction between defeat and surrender, and that chips away, I think, at this argument.

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Second, we use this word decision, which I think is a very troubling concept to attach to what actually happened. I mean, if we use the word in its, sort of legitimate way, it means we gather together, we weigh the pros and the cons, we deliberate about it, we think, we vote—that's not what happened at all. There was so much momentum here, that was being driven out of Truman's will. Truman steps into a situation where he does not even know about the thing and he is surrounded by some very, very distinguished people that he held in the highest regard. There is no one higher than George Marshall or Henry Stimson. Is he going to tell those two people no; we are not going to drop the bomb? So, he goes along with the whole flow. All I am saying is that the decision is not quite the right word here. General Groves made a statement and once said that Truman was like a little boy in a toboggan.

[Laughter]

Unidentified Male: He later apologized to Truman. That is sort of the concept of what we have here is that this thing is a runaway locomotive; it is not going to be stopped. The only thing that Truman could have done was to say no. Now, he did say no at one point because the order was, we are going to use these bombs as made ready, quote unquote, this plutonium coming out of hand lickety-split, they are being fabricated into things, a third bomb was ready to go on August 17 or 18, and finally Truman intervened. So, basically we had pre elevation here. I mean, you keep using them until you are told not to, and finally Truman said enough.

Unidentified Male: You mean the seventeenth or eighteenth.

Unidentified Male: August 17 or 18.

Unidentified Male: It was the third...

Unidentified Male: It was the third and the fourth and the fifth... they would have kept coming for as long as it took, General Groves being [00:51:00] the manager that he was. He thought, by the way, two were going to be enough, but... anyway... so at a certain point, Truman did intervene finally, and said stop, and then we heard that the Emperor intervened and the Japanese were about to really surrender, so just a couple of comments.

Charles Ferguson: Yeah, Cindy had me on the agenda as a designated commenter on this fascinating discussion, and I think a lot of you raise very great points, especially Stan here, just very recently, and Dick. One of the things I was marking down as a comment I wanted to make, and I will just underscore his point about Japan's perspective, Japan's side of the story. But Sam also mentioned, we are getting some new Japanese sources coming to light. Perhaps part of the effort here with this project is to try to get some of the Japanese materials translated to English, try to get that into this exhibit, or whatever we are going to do with this part of the project, so I want to endorse that.

And Stan's point too, I think is well argued. A few things I want to mention, because I am coming out as my street cred here, those of you who don't know me, is I'm kind of an atomic scientist, the relatively new president of Federation of American Scientists, which had been Federation of Atomic Scientists back in the day, and I spent a couple summers working at Los Alamos in the late 1980s when I was much younger and at that time I was in the U.S. nuclear navy, so I'm coming at this from a perspective of someone who had been a junior officer at the end of the cold war on a

ballistic missile submarine, and trained about the targeting package of that submarine. After going through that training, in late November 1989, I decided no thanks; I am getting out of here. So, there's obviously a big moral dimension here too.

A few people alluded I think, Dick and Sam were two of them, about the role of atomic scientists, but I haven't heard much of this discussion yet about how much the atomic scientists had any kind of influence. Call it a decision, or not a decision, or this juggernaut. Were they really integral at all in terms of what was going on here in Washington at the time, or were they just... you know, hired technical hands. It was basically their role and they made the gadgets and their role was to keep churning out the plutonium and the HEU and so there's that. Then, what role did they play post use of the atomic bombs in terms of shaping the policy.

**[The Debate Over the Bomb: Richard Rhodes, Peter Kuznick, Robert Norris, Sam Walker, Alex Wellerstein](#)**

Charles Ferguson: Then another thing I wanted to get at here, [00:54:00] two other things and then I'll be quiet and let other people speak; this issue of squaring the use of the atomic bombs with just war theory. Were civilians a just target? We in the United States said wait a minute, Hiroshima, Nagasaki there were some military installations there, so they were kind of military targets. We had this strategic bombing campaign going in Germany and Japan for years using conventional means and so, as Stan was arguing, you know there is a lot of inertia in the system to target civilian populations. But let's step back and ask, should this be part of the project, the exhibit, to get people to question again about the role of targeting civilians, mostly noncombatants, in these cities with not just nuclear, but conventional weapons?

That leads to my next point about was the atomic bomb, especially at that time, really truly revolutionary, really qualitatively different? Yes, one bomb, one city, but Dick is sort of shaking his head no, and but you know others argue that with the fire bombings of Dresden and Tokyo actually killed more people using more bombs, so to speak, and more sorties of airplanes, but still you can create a lot of damage with those means too. So, we were running out of targets in Japan as well, so at some point, even though we are cranking out plutonium every few weeks for bomb cores, what would be left to bomb at that point? So, I just wanted to throw those ideas out.

Unidentified Male: For whatever reason, the railroads had not been touched. If the railroads had been bombed, which was coming very soon if the war had not ended, and the Japanese population would have faced mass starvation, which they hadn't reached that point yet. They were not living the high life, but they were eating. Once the railroads were bombed, then mass starvation was on the...

Unidentified Male: I'm not so sure a qualitative difference, but just one question about clarification. What did they actually know about fission fall out at that time from these things? I am not sure it was that clear.

Unidentified Male: Not a lot.

Unidentified Male: There's actually a really great article that just came out last summer about this. Sean Malloy [PH] in the Journal of Diplomatic History, and he's the only person I've seen who has given a deep, documentary approach to what did they know about radiation. What did they

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know about fall out? And it's actually a very complicated answer, and the answer is some of the scientists at Los Alamos had a very good idea of it, but they were not in the decision-making flow. When Oppenheimer was not interested in the question, and even the question at the height of the bomb, that was not why they chose the height. [00:57:00] The height was chosen for blast damage. It happens to coincidentally work out with that. After the fact that was, a nice argument for why they did not think radiation was an issue. They almost completely ignored... there are some very disturbing, wonderful reports where they actually suggest that there is a very Los Alamos wartime suggestion, one of the scientists said you know we can create an artificial thunderstorm if we detonate this under the right conditions, and then that would rain down radiation along the countryside and kill more people. They did not do this, but at Los Alamos, they were thinking questions like this, but it was not... Truman had no inkling whatsoever about any of that stuff.

Unidentified Male: And yet I think about the fact that a year or two earlier, Roosevelt had been offered the possibility of using poison gas on Iwo Jima as a way of not having to deal with all the entrenched Japanese troops on that island. I guess it was staffed all the way up to Roosevelt and he said no. but there certainly was, in my reading, a sense that we want this bomb just to be like a conventional bomb; and then that came back to haunt us after the war when the whole question became, well these are just like regular weapons. We can build a lot of them. The failure to appreciate the change of scale of the destructiveness that these bombs were little bombs, not nearly the biggest that could be designed, I think really complicated the understanding about what was going to follow with the Cold War and led in part to the whole huge arsenal that we did finally build.

Unidentified Male: To say something about Charles's point, there is an article by Bernstein about the... I don't know what General Marshall was thinking about here, but General Marshall was considering the use of these new weapons [Unintelligible] [00:58:57] to [00:59:02] the beaches. Again, I do not know what he was thinking, but anyway that got nixed and Groves said no, we have got to go with the bombers and all the rest. Again, here we are going to have an invasion and we are going to use atomic weapons in the invasion.

Unidentified Male: Well, that is why the atomic cannon thing in the eight-shot was done.

Unidentified Male: Well, after the war, they did everything. It seemed like a good idea at the time and we did everything.

Unidentified Male: I think when we deal with this whole issue, at some point we have to deal with the issue of radiation. I wasn't impressed with the article on that issue because it doesn't deal with what the impact of fallout from the bombs of Hiroshima and Nagasaki, which most people assume there was and has been and still is an epidemic of people die from radiation poisoning in Hiroshima and Nagasaki. The Atomic Bomb Casualty [01:00:00] Commission which was replaced by the Radiation Effects Research Foundation, and they have done great work of studying the impact of radiation on survivors at Hiroshima-Nagasaki. I forgot when their last report came out. The last one I saw, over a period of about fifty years after 1950 when they started their work, the total number of deaths from radiation, above what you would expect from normal cancer rates in those two cities anyway, over fifty years total of about eight hundred and fifty people. Not to be dismissed by any means, but those studies are the basis for almost all we know about radiation effects at fairly low levels. But it wasn't and hasn't been and is not today an epidemic and I think that's important for people to know because the impression is quite different and it's an impression

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that the Mayor of Hiroshima adds to each year when he reads a list of people who died from cancer in the past year; another controversial issue.

Unidentified Male: One of the things that always strikes me is the scant involvement of the top politicians in the Manhattan Project when you have nothing to do with a war effort that was ongoing. In fact, in military terms you could say the defeat of Japan was a far more simple proposition than the war in Europe when you are liberating occupied countries and you have to come to some sort of end stage agreement with the Russians about who was going to take Berlin and what have you. When the politicians were involved, their horizon was very short. The influence they had was really concerned with the impact over the next few weeks or months. You contrast that with the scientists, with things like the Frank report. Their views on the subject were far over reaching and presumptive. The same with this Niels Bohr, you know, who did his best to try and get Roosevelt and Churchill to look at the long-term implications of the weapons.

Unidentified Male: Bill Lanouette has written a play called—let's see what's the title?

[Cross Talk] *Uranium and Peaches*.

Unidentified Male: Uranium and peaches which is about Leo Szilard going to see Jimmy Burns about whether or not they could tell the Japanese or something before they used the bomb. I mean, again, there are resources like that. My play *Reykjavik* is available.

[Laughter]

Unidentified Male: This actually dove-tails into a question I had that relates to what Charles said earlier about when do we bring the scientists in on this? One thing that I was surprised that nobody mentioned was related to the Frank report, that this whole petition to demonstrate, rather than to drop on the city, which to me is the sort of thing that is another one of these things that keeps coming up as part of the contested narrative of the bomb. Maybe we could have shown them first; put it in the Tokyo bay first, and later drop it on actual cities—and is actually a narrative that for an exhibit context, actually somewhat worries me because it is such a tempting place to go because we are talking about the actual people and the actual time, and it's very easy to privilege the position of somebody like Szilard or something like that is very charismatic and all that. But I just wanted... if any of you had thoughts about that as... well, if there were any thoughts at all about that.

[Laughter]

Unidentified Male: Maybe it was not...

Unidentified Male: No, I know the argument... my question is whether or not that should become... How about fits or does not fit into those polarized positions.

Unidentified Male: They did a survey, a poll of the scientists at Los Alamos who were overwhelmingly in favor of a test demonstration before dropping it.

Unidentified Male: When was that done?

Unidentified Male: July of forty-five.

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Unidentified Male: Who did the poll?

Unidentified Male: Frank and Daniels.

Unidentified Male: Oh really?

[Cross Talk] [01:04:33] to [01:04:37]

Unidentified Male: No, no, this was Los Alamos.

Unidentified Male: But again, that was after Hitler had been defeated.

Unidentified Male: Yes.

Unidentified Male: The whole attitude changed very much after VE Day.

Unidentified Male: But I wanted to pose a different counter-fact, one that I always thought... and that is what if Henry Wallace had become president instead of Harry Truman. Very few Americans have any idea... they do not even know who Wallace is any more... they do not know how close he came to getting the nomination. On July 20, 1944, the day the Democratic Convention started, they did a survey, a Gallup Poll of potential democratic voters. Sixty-five percent said they wanted Wallace on the ticket as vice president; two percent said they wanted Harry Truman and in the midst of that first night, the club head was trying to fight his way to the microphone to get Wallace's name and nomination back on the ticket and become President instead of Truman. He got five feet from the microphone before they adjourned the session. Everybody yelled out no when they said motion to adjourn. Had he gotten five more feet, I am almost certain there would have been no atomic bombing in 1945. He was leading the fight against nuclear weapons after the war, but that is another counter-factual. But Charles asked about bombing civilians. Admiral Leahy, who was Truman's personal chief of staff, and Chair of Means the Joint Chiefs of Staff said afterwards the Japanese were already defeated and ready to surrender. The use of this barbarous weapon at Hiroshima and Nagasaki was of no material assistance in our war against Japan. Being the first to use it, we adopted ethical standard common to the barbarians of the dark ages. I was not taught to make war in that fashion. Wars cannot be won by destroying women and children.

Unidentified Male: Well, it wasn't just Leahy. Six of the seven five star admirals and generals, who got their fifth star during the war, are on record saying that the atomic bomb was morally reprehensible and militarily unnecessary. MacArthur, who I consider a little extreme, resorted to inform President Hoover, said that your memo was brilliant, right on. He said that if we had told him they could keep the emperor like you suggested, the Japanese would have surrendered in May. I think that's a little bit premature, but it wasn't only... it was also Eisenhower, it was Nimitz, we can go through the whole crew. So there was a lot of that kind of understanding. But even earlier, and that's why I disagree somewhat with the emphasis that people are putting on this, I think that [01:07:00] we knew that the Japanese understood they weren't going to win. As early as February 1945, Prince Fumimaro Konoe, former prime minister writes to the emperor, says I regret to say that Japan's defeat is inevitable. He says what he is concerned about, is a communist revolution when that takes effect. But if you look at—we have been intercepting Japanese cables; we had broken their codes before the war. We knew what they were saying; we knew that from Togo to

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Sato and back, we knew all those telegrams and based upon that, our intelligence reports on April 11, the joint intelligence staff reports: if at any time the USSR should enter the war, all Japanese will realize that absolute defeat is inevitable. We have the cable... or intelligence report after intelligence report saying that. We have the Japanese sources saying that if the Russians come into the war, the war is over, we have to surrender.

Truman says, before he goes to Potsdam, he said I'm going to make sure the Russians are coming in, and then he gets word from Stalin. It says Stalin will be in the Jap war August 15, "fini Japs" when that occurs. The next day he writes to his wife and he says that the war will end a year sooner now. Think of all the boys who won't be killed. There's an enormous amount of evidence that we understood that that was going to be the case, and that finally is what makes the difference because we were saying that strategic bombing, we had bombs, according to Yuki Tanaka over a hundred... fire bombed over a hundred Japanese cities. Destruction reached ninety-nine point five percent of the city of Toyama, ninety-nine point five percent. That's more than any place. So, the Russians invade and that's what turns the tide, because the Japanese already knew we could wipe out cities. They don't give a shit if we were wiping out cities, the Japanese leaders. What changes it is the Russian invasion that undermined their diplomatic strategy, which was to try to get the Russians to intervene on the Japanese behalf to get better surrender terms, and they undermined the Ketsugo military strategy. Now they couldn't put up resistance to the United States.

So when Prime Minister Suzuki was asked on the tenth, why they hadn't surrendered so quickly, he says "I can't wait—if we miss today, the Soviet Union will take not only Manchuria, Korea, Karafuto but also Hokkaido; they will destroy the foundation of Japan. We must end the war; we can deal with the U.S". I mean the Soviet invasion that changes the equation, not wiping out cities, which we had been doing. It did not make that much difference. In fact, the war minister, [Korechika] Anami comes into the meeting on August 9 and says we have intelligence that the Americans have a hundred more atomic bombs and that Tokyo is the next target. And even that didn't change anybody's opinion. But what they say, if you read the reports, was that the Soviet invasion changed everything. So, I think in an exhibit, you have to of course, present all sides; but I think you have to have a strong statement of this kind of argument. Because this is something I write about a lot, and I do not quite see the same [01:10:00] points that Sam does about the surrender, because... from the Japanese side, because they did surrender.

Like I was saying, the difference between defeat and surrender, but they did surrender and they surrendered very quickly. Now, we anticipated that they would surrender, not so much based on the atomic bomb. That might have been a factor; they all latched on to that as a factor...

Unidentified Male: I am sorry... what changed after Hiroshima was that the emperor said for the first time, the war had to end. He did not say it has to end on the basis of the Potsdam Proclamation, but he did say the war has to end. The emperor had never said that.

Unidentified Male: In June, he had...

Unidentified Male: But in July he said, what we need is another invasion.

Unidentified Male: So the emperor could not make up his mind. He was trying to save his own rear end and that is why he finally opted for surrender, because Hiroshima proved to him that his own rear end was in dire straits. I do not think there is any other...



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Unidentified Male: I think that it was definitely the Soviet invasion that...

[Cross Talk] [01:11:00] to [01:11:05]

Unidentified Male: ...they had to go along with the emperor's...

Unidentified Male: If you look at it from the United States perspective, it is not... you mentioned the Weckerling memo, but after that, Truman gets to telegram... the July 18 telegram. He refers to it as the telegram from the Jap emperor asking for peace.

Unidentified Male: But it does not say under what conditions. The militants, and apparently the emperor, were saying "yes, we will surrender if the emperor can stay on his throne; apparently, as a divine ruler; if we can conduct our own war crime trials; if the U.S. agrees to not occupy Japan and four if we can disarm ourselves." That is what the Japanese were talking about in terms of surrender terms until after Hiroshima and after the Soviet invasion.

Unidentified Male: Right, then the war council is divided, three to three over which terms: whether it's one demand or the one demand plus the three other demands.

Unidentified Male: Can we just videotape this today and put it in the...

[Laughter]

Unidentified Male: ...for using the bomb, or why did Truman use the bomb?

[Cross Talk] [01:12:08]

Unidentified Male: As others were saying, that it is largely inertia. I think Stan is right on that, when it comes to Truman. But when it comes to Groves, and it comes to Burns, we have other evidence. Groves says that from the beginning of the war, this project, "I did not think the Russians were our allies. I conducted from the very start, as if the Soviet... the Russians were our enemy. I conducted on that basis". And Burns, when Szilard went to the White House to see Truman, Truman sends him down to Spartanburg, South Carolina to see Burns on May 28 and that discussion is fascinating. Because Burns says very much, "Well you're Hungarian, aren't you? Don't you want to roll back the Russians in Europe?" They are arguing against using the bomb and Szilard was outraged that Burns would think that way. And Burns and Groves have a lot of influence on Truman's decision. So I say in some ways Truman takes responsibility, but he's not ultimately...he is like a little boy in a toboggan.

[Cross Talk] [01:13:00]

Unidentified Male: But it is to intimidate the soviets?

Unidentified Male: I think that's a factor, but I wouldn't guess along with Truman and say I know what he's thinking, because to me it's like thinking along with George W. Bush. You know, I can't quite get into his mind, but I...

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Unidentified Male: Specifically, when he had gone to Potsdam to get the Russian's in, but once the bomb test was good, he wanted to keep the Russians out.

Unidentified Male: He says, Burns says to him, and Churchill says they want to keep the Russians out.

Unidentified Male: Does this mean they were sending a message to the Russians; they were trying to prevent the Russians from joining the war—to prevent them from getting a piece of Japan.

[Cross Talk] [01:13:40] to [01:13:45]

Unidentified Male: ... Manchuria, Outer Mongolia and Port Darien and Port Arthur...

Unidentified Male: Those quotes that you have from Leahy and others, that is all after the bomb is used. No general or admiral ever said any protest against using the bomb prior to Hiroshima.

Unidentified Male: Yes, I think... we do not know. We just do not have the record.

[Cross Talk] [01:14:06] to [01:14:11]

Unidentified Male: Eisenhower being the classic case, who tries to puff himself up and say that he went Stimson before. Groves was suspicious of this whole matter. He didn't get along with Eisenhower at all and he checked with Stimson and Kyle, who was chief of staff of Stimson, and Eisenhower did nothing, so he blew that argument out of the water and...

[Cross Talk] [01:14:33]

Unidentified Male: These are wonderful quotes, but they all come afterwards when everybody is trying to look very good about the whole thing and none of them stood up beforehand.

Unidentified Male: Charles has been waiting...

Unidentified Male: No, I'm trying to... maybe a bit playing Solomon here, but listening to Peter, and especially Sam and the back-and-forth is fascinating, so it seems to me, listening to this, the most important decision in my mind was not Truman's decision, which I think Sam is convincing me it really wasn't a real decision there. The real decision is the Japanese leadership's decision. What really influenced them to end the war? Was it the fear of Soviet invasion much more so than fear of atomic bombs, or some combination? Peter I think is making a good argument... let me distill it down in terms of that the Soviets are gobbling up Japanese territory. Even to this very day, we are seeing territorial disputes as being a huge bone of contention between South Korea and Japan, China-Japan... It's still there in recent day, so I can see that could be a strong motivator for the emperor and his leadership to say, okay, the Soviets are breathing down on us, let's get the hell out of this war. Or, was it as Sam was arguing, wait a minute, Hiroshima was revolutionary, one bomb-one city, the emperor's like oh crap! Can we end it... or is there a clear one side or the other? Or is it more complicated than that in terms of the decision making process in Japan?

Unidentified Male: We disagree on this obviously, but I think if you look at the statements from American intelligence, what they knew the effect of the Soviet invasion was going to be... If you

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look at the statements from the Japanese leaders about why they keep the Soviets out of the war, had Stalin been allowed to sign the Potsdam Proclamation, there might have been a signal to the Japanese that the Russians were coming into the war. But Truman didn't let him sign the Potsdam Proclamation, even though he wanted to, and he brought his own version, his own draft, because he wanted to, but we wouldn't let him sign the Potsdam Proclamation, and I think that's because we didn't want to give that signal to them. Stan makes a good point though about the timing, because we do not know what they said privately to anybody. Eisenhower... it's an interesting case because Eisenhower claims that he told Truman, he told Ambrose that he told Truman not to use the bomb, but Eisenhower is more responsible than anybody. When Eisenhower took office, we had about a thousand atomic bombs, a little more, [01:17:00] but when he leaves office, we had twenty-three thousand atomic bombs. His budgeting cycle is good for thirty thousand atomic bombs. So, his position is very confusing, but I want to know what you think.

[Laughter]

Unidentified Male: I want to know what you think of Groves' memo. Groves issued an order that none of the generals were allowed to make any comment about the atomic bombing, and he says I do not want MacArthur or any of the others to say that we did not need to use the bombs in the war. He issues that beforehand, a gag order on that because I think there was a lot more discussion opposition before the fact, but we do not know because we do not have the record of that. We do know McCloy raised it at the June 18 meeting. We do know that Ralph Bard wrote that memo, we do... there are some hints of this, but we do not know for sure you are saying, what they actually said.

Unidentified Male: What the military said?

Unidentified Male: Yeah.

Unidentified Male: I agree. There were civilian raising of the issue as far as... I am not familiar with that memo that you talked about, Groves... a gag order on the military. It would not surprise me. Groves was obsessed with getting this bomb used as quickly as possible, and any interference by anyone, he was going to get steamrolled and pushed aside. So, it wouldn't surprise me that he wanted as few people to know about everything as possible. We have a pyramid here of people at the bottom not even knowing what they are working on and only at the very top is Groves and maybe a secretary, Mrs. O'Leary, she probably knew about the things as well. But he was the only one who knew everything and everybody else knew portions of it. So, it wouldn't surprise me. I would like to know about that memo, Peter.

[Cross Talk] [01:19:01]

Unidentified Male: Can I make a comment on... I am exhibiting this because the issue comes down to did this sort of violate American ethos and American values, and I want to point out... Jay brought up the More Perfect Union exhibit about the Japanese incarceration. That was done as a celebration, an Art Museum of the bicentennial of the Constitution. We took that point and our director was able to get that through Congress. There is some hate mail, but not a whole lot. But it happened, and the way it was done, this was viewed as a corrective to... we had a correctable system. The Constitution could protect itself and that is how it was... was one way this very difficult issue was presented. Context is everything and I want to point this out. When this exhibit was done

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in 1987, these kinds of exhibits were de rigueur. Those questioning exhibits were [01:20:00] allowed. The climate was really very different, and I want to point out, that the head curator of that exhibit, of the More Perfect Union, you know who that was? It was Tom Crouch from the Air and Space Museum, he was the head curator of the Enola Gay exhibit and he felt very emboldened by this exhibition, getting this through, because he was right in the middle of these debates with the Japanese-American community and a very strong director backing him up in these arguments. But at that time, you were expected to stand up against these kinds of forces, and we were criticized at the museum for doing exhibits that rolled over to the powers that be, and so on. This was the way to go, and so I am sure this had... Tom's not here, but he could be here talking to us and that when he got to the Enola Gay, that was all... the Enola Gay was all part of... it was called the Last Act, and it was all part of the strategic bombing kind of scenario. It started with a World War I exhibit and went up to there. All of the pressures there were to do exhibits that were hard charging and based on things like this exhibit in 1987. What happened in 1994, the Congress changed. Suddenly everything flipped on that [Unintelligible] [01:21:13] to [01:21:16]. I am not sure right now would be... I think we could do something like this and talk about these contradictions and so I can get away with it until the next change of... well, it is changed though.

[Laughter]

Unidentified Male: Just to comment on the expansion of the number of nuclear weapons under Eisenhower's presidency, it probably was inevitable from the ramped up production under the Truman administration. Again, it reflects the industrial nature of the project and the lag time. The money was poured into nuclear facilities straight after the war production of tritium and plutonium was just immense. So, whoever won the election in 1952 was going to inherit this fantastic stream of fissile material, which they had to do something with. The other thought I just want to make is that David Holloway makes very clearly that whatever the effect of a Russian bomb on Japan; it certainly had a hell of an effect on Stalin and galvanizations of the Soviet program.

Unidentified Male: Well, Stalin had been rather sure that this was disinformation about this bomb anyway. It was exactly the first film footage that Soviet intelligence brought back from Hiroshima that convinced him and he called in Kurchatov and said give me the bomb comrade. And also, accelerated his entry into the war. That was the other part.

Unidentified Male: A couple, or three things... one, historians have a penchant for wanting to find the answer. [Laughter] And on a complex [01:23:00] thing like this, maybe we need to be the engineer type to think in parallel. There are a lot of things going on here that all are strong contributing factors on both sides... both on Japan and on this side. The other one is, we can discuss what was Japan thinking. What was the U.S. thinking? But nobody has mentioned what did each one really think about what the other one was thinking because that's what their decisions are going to be based on. And to say that these things don't change over time, look further ahead into the Cold War and the decision not to develop a neutron bomb where the idea was to kill live things and leave all the monuments intact.

Unidentified Male: Well, I think part of the problem there was that they could blast yield and the fire yield were still pretty high.

Unidentified Male: It was.

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Unidentified Male: Not Hiroshima level.

Unidentified Male: It was, but the concept was to do more personal damage with radiation.

Unidentified Male: The concept was to make the Germans feel more secure that we would actually use nuclear weapons in vastly populated Germany, so that they wouldn't sign a separate peace with the Soviets.

Unidentified Male: We could put an antenna on it and it would direct it all in the right direction.

Unidentified Female: Someone had suggested we bring the Japanese point of view in and I've always been fascinated with the idea of the exhibit being on U.S., U.S.S.R., I mean, we could throw in Germany and Britain too, but we could just say the three major players, and Japan. Certainly, when we get to this issue and Hasegawa's treatment is fascinating. He looks at... sort of answers your question looking at the three from a psycho whatever... psychological point of view and each of the three leaders and their countries and so that's very interesting. But I just wanted to fall on Charles' point about the Japanese concern about Russia. Ward Wilson has just come out with *Five Myths about Nuclear Weapons*, a new book, and he translates the diaries... or he's obviously read the diaries of the Supreme Council Members in Japan; and he has read other things that indicate that they were really blasé. I am overstating this, but certainly blasé about Hiroshima because they had already had ninety-five other cities blasted to smithereens and they did not convene the Supreme Council, which most nations, if they feel there is a huge threat, they will bring their leaders together quickly. That was not until word of the Soviet invasion, which came midnight [01:26:00] of August 8... Within six hours, the Supreme Council was together. The diaries indicated they were extremely perturbed by that... very upset. And this goes back to a hundred years history. These were archenemies; it is just not... anyway, there was a lot of feeling on that. So I don't know, can we really understand this by just looking at the Manhattan Project on these issues as you just suggested? I don't know... how big can this exhibit be?

[Laughter]

Unidentified Male: As you bring back in the idea that strategic bombing of cities was nothing new by then. It wasn't even new when they started it with Japan.

Unidentified Male: Right, exactly.

[Cross Talk] [01:26:47] to [01:26:51]

Unidentified Male: If I were immediately thinking of a way to... We could certainly approach it from the point of view of the Manhattan Project's part in getting the bomb ready and perhaps the meeting with Stimson where they discussed... not Stimson, with Burns, where they discussed the post-war issue a little bit. And Oppenheimer famously said that you really couldn't do a test with any of this... the Japanese would move American prisoners of war into Hiroshima-Nagasaki and cities like that, or they wouldn't be impressed by a big... they called it a big firecracker in the sky. So, that part could be there without doing all of the rest of it. Then you could send them to the bookstore and we could buy Ward Wilson's book and ten others as well.

[Laughter]

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Cynthia Kelly: I violated my own principles, which was to let the reflectors reflect, although I think Charles did not realize, we do it at the end.

[Cross Talk] [01:27:52]

Charles Ferguson: I need to apologize because I missed a good part of the morning session because I am dealing with a current U.S.-Japan issue. I am co-chairing the U.S.-Japan nuclear working group and I had a meeting this morning with a DOE official. We are going to Vienna next week and so I am a little booked today, so I apologize for missing part of the morning session. I did not know the... that is why I was thrusting myself in to make comments.

[Laughter]

Unidentified Female: Maybe you could ask the commission whether they would like to have a joint exhibit? [laughter]

Unidentified Male: Well, we are thinking about outreach for our group this summer in Japan and we are thinking Hiroshima might be a place to go where we can see pros and cons, but I think it's (inaudible) [01:28:35] whether to do it or not.

Unidentified Male: If you have never attended the August 6 ceremony, it is where the... an extraordinary experience.

Unidentified Male: Yeah, I have never been so...

Unidentified Male: I think most of all the Japanese tradition of putting little candles on little boats, dropping them in the river when full tide is coming in... These thousands of little lighted boats go up river and late at night, they go out to sea. It is really very moving. [01:29:00] The souls of the dead.

Unidentified Male: My students are often in tears at the lantern ceremony.

Unidentified Male: Your what?

Unidentified Male: My students are often in tears at the lantern ceremony. But you also have to go to Nagasaki, which is a very different experience.

Unidentified Male: That is not about Japanese or anyone else. That is just about death and war.

Unidentified Female: And Sandy, you were the other reflector.

Sandy Weber: Yes, well these have been some very invigorating discussions. And although we may not often agree, there may be some disagreements in how we parse historical events, I do see some consensus clearly building on how we should present whatever it is that we decide to go. Very clearly, I think we are agreeing that whatever this exhibit is, it should absolutely not present itself as the official version. It does not have the answer. It is neither the traditional view, nor the revisionist view, nor any one of those views in between that scholars are now going for. It is not an official

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version view of history or science, but I think what we are saying we want is some sort of interactive dialogue with the public so that they can make themselves part of that scholarly discussion in thinking.

We need to help present to them, expose them to emotional and intellectual stories, facets of the stories, themes, ideas that may not have occurred to them before so that they can build that platform that I think Dr. Robb [PH] mentioned earlier this morning. We are trying to give them a platform of knowledge, impressions, or emotions that they can continue thinking about these stories and what they mean in our world at large, and to them. It is important that that platform be multi-faceted.

Someone mentioned a module. I am sorry; I do not remember who right now, but there have to be all kinds of different facets and lenses in this story. I can tell you, I grew up in Peoria, Illinois in the middle of nowhere. We had a tiny little local museum, Glen Oak Museum. If there had been any traveling exhibit there on nuclear power or the Manhattan Project, there's no way I would have gone to that. It would have held no interest for me whatsoever. It is important so that we do not just keep this exhibit talking to people who are already interested in this subject. I think what I am hearing is that one of the aims is to expose wider audiences to these stories and these issues and these concerns. We have to find a way to entice them in. It has to discuss the science story, the military history, biographies, morality, politics, engineering, social protest. It has to have these other hooks so that other people will be interested enough to [01:32:00] come.

Now, saying that, we do not want to just be chaotic. It cannot just be a chaotic Tower of Babel exhibit with a panel for everybody, that is not what I or we are saying. It needs to have that moderator function in it and I think Dr. Freeman had brought up. We need some sort of framework on which to hold these hooks to place these modules, and that framework is legitimate. There are certain facts that we build upon. Those facts may be they are amenable to interpretation; and they may change as history comes and goes; but we can't just stand back totally neutral and let every voice come in and let every voice just fight it out. I think our roles as museum educators and scientists and historians, is to be that moderator to help the public, who has not had the education or the experience in these topics of the discussions that we have, to expose them to these different viewpoints, these different voices, these different views, and to help them explore them a little bit. It is not to tell them the whole story; it is not to give them the answer. Sort of our motto in the Park Service that we hit ourselves when we get off track is interpretation, provocation, not information, not education in a traditional sense. Provocation, not necessarily angry provocation, I don't mean provocation in the sense that you make someone angry, or you upset them, but incites them, their curiosity, their concern even, or their willingness to engage in something.

That's what I think we are trying to do here is set up an exhibit that doesn't purport to have all the answers, or the latest scholarly discussions or conclusions; but rather it's a way to invite the public in to the scholarly process, to let them think about things. And to get their voices heard and to let them think about it themselves... arouse their own curiosity.

One of the other major themes that we have heard again, in this panel and in the earlier ones, was that we have to have that diversity of voices and that diversity of viewpoints. I guess I had just assumed right from the get go the Japanese viewpoint would be included. So, to me that was sort of a... [Laughter] and it does not say again that it is just everybody gets in there and everybody gets the exact same piece of pie on the exhibit. The important thing is that people see that their viewpoint is at least acknowledged. It does not have to be said that this is right and this one's

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wrong. It does not have to be said that this one is more right and this one is more wrong. People just need to know they are not being disrespected. I think it was false that the Enola Gay exhibit, because people hadn't even seen the whole exhibit, a lot of [01:35:00] veteran's thought they were being disrespected, that their viewpoint wasn't in there. So there has to be a way to let various view points at least be acknowledged and say yes, we know you feel that way. Here are other ways that other people are feeling. It can be done. I know it sort of sounds like that's just everything, everyone gets their piece. That is not what we are saying. We found that does not work, obviously, but they have to... we cannot do it by other people's opinions. They have the right to hold that opinion because they formed that opinion based on their experiences, their worldview and the way things went down. Again, we have a little motto; in fact, it is like a little size of a business card; it is the Visitor Bill of Rights that we tell Rangers to put in their front pocket. They sometimes... oh these people... you know? You get that when you work with them every day, but in that Visitor Bill of Rights, the basic fundamental is that the visitor is sovereign. They have a right to hold their own opinions and they have a right to decide themselves how they are going to feel about this or that.

Just a very quick example, traditionally in the Park Service we use our enabling legislation to tell us why that park is significant and that is what our interpretation traditionally has been centered around. Guadalupe Mountains in Texas was established for its geological formation and so almost all the Rangers there are geologists and scientists and those are the kinds of talks they give, geology talks. But you're only going to be successful with visitors who are into geology. You might catch a few just by chance that get it in terms of hearing the talk, but we found out doing surveys and talking to the visitors that a large group of foreign visitors come there, particularly from Germany, because they've read this little series of Westerns that were set in the Southwest and this is the setting. Thousands upon thousands of Germans come to the Southwest to the National Parks every year...

Unidentified Male: Karl May

Sandy Weber: That's it, Karl May wrote this series and they want to see the settings for these. They do not give a hoot about the geology, and if we have actually been force-feeding this geology, they are having a negative experience if they are forced to go through this geology. We are there to facilitate their own personal connection with that place. Bottom line is, I do not care why they care about the park, as long as they care about it and understand its value to our heritage... national, natural or cultural heritage, and they are not doing damage to that resource, it is okay to help them... give them access to the park in a way that works for them. The local Apache people, their creation location is there in the park. They have a very different view in that park. Again, it is not geology; it is their creation story, and the local community... that is where everybody goes on Senior Skip Day. It has a huge emotional connection for them [01:38:00] because when they were seventeen years old they got out of school and they go to the park and drink and have fun and move on into adulthood.

So, what we are trying to... ourselves as interpreters, become more sophisticated in understanding that there are many, many meanings. They are all valid, everybody who can respect their vision, their point of view and that meaning, but at the same time, we want to help expose them to other meanings, deeper ones, and more complex ones they may not have considered. So, that's our role, not as a teacher, not to force feed them information, not to give them a test at the end to make sure they learned what we wanted them to learn in the Park. But rather to be that moderator, that catalyst that helps them find some meaning emotionally and intellectually, whatever it means. And I hear that. You may not be saying it in quite those words, but I have been hearing that this morning in



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these discussions that we have to find a way for people to care enough to learn a little about history and the depths, because most of us have a very narrow, very simplistic understanding. We think it is a true story, but we are not even close. But you've got to get them in there first. We have to have those folks in those modules, to get them into this exhibit and acknowledge where they are. You have to meet them where they are, and then hopefully broaden out their vision and then even better, they can go back and continue that dialogue themselves internally in their mind, with their peers and with other people they've been talking to. So, I do see... I keep hearing these sorts of things coming out in these conversations, which is nice. I will close real quickly here, I don't want to take too much time.

I will show you how far we have come. We sit here and so, oh this is going to be rough, you know the Enola Gay was rough. And this is a tough subject. This is not going to be an easy one, but this is an ad I got in the mail fifteen years ago. It just came in off the junk mail and these people are trying to sell me the new U.S. Army in World War II. This was what was on the ad. We had a full factual account of World War II thoroughly documented and completely objective. Every fact has been checked and double-checked. Every presumption has been clarified; every inconsistency has been resolved in this story. Now, clearly we are way beyond this. The mere fact that we are having these discussions show that we may not get to Nirvana where we hope to be, but we are making progress in understanding that history and science are constantly evolving, it always changes. The trick is to help the general public as a whole understand [01:41:00] that they are a part of that process. They are a product of science and history; they are creating science and history right now. They don't know that now, and we haven't let them know that, so we have to invite them into the conversations and let them see how they are impacting... how they were formed by it and how they are affecting it.

Unidentified Male: Great, thank you all.

Unidentified Female: Thanks very much, why don't we take a break for fifteen minutes and come back.

### [Presentation: Culture of Secrecy by Alex Wellerstein and Mac West](#)

Unidentified Female: Okay I think it is time to get...

Unidentified Male: I am deeply concerned.

Alex Wellerstein: We have been charged with talking about secrecy in the Manhattan Project, which is both something that runs through every single other topic we have here, but is also sort of a historical side of interest in and of itself. So, the context and thing, and the way we were going to divide this up was, I'm going to talk about it like a historian, and Mac is going to talk about it like a museum person, because it turns out, we just look at the world in a completely different way.

What I want to do is try to frame what I am calling the practices, narratives and questions. I will try to explain what that is. This image though, by the way, you may or may not have seen it. You probably recognize the subtitle there. That is the title of the Smyth Report. The Smyth Report was originally supposed to be called Atomic Bombs, but Groves was so afraid of the secrecy breaking, that he made them only apply it with a red stamp just before release and he forgot to do it. So the only copy that has the red stamp on it is the one they sent to the Library of Congress for the

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copyright registration, which is that copy there. So, the secrecy of even the title of our understanding of the bomb, in a very direct way.

I think you have the little thing there... okay, we will see if this works. I am not running off of PowerPoint, really, I'm doing a PDF, so... first thing I want to do is just do a brief historical chronology, make sure we are all on the same page and just highlight a few things about the history of Manhattan Project secrecy that I think are not extremely well known. I say this as the guy who's finishing a book on the history of secrecy in Manhattan Project to the present, so some of these things will be known, some of these things are I think some obscure points. But just to quickly go over a few things... secrecy, as most people know, starts in early 1939. Leo Szilard urges self-censorship, this does not really work, but one thing that I think is often not appreciated, is that his self-censorship regime becomes the first institutional bodies that become interested in uranium work, and start reviewing physics papers. And it searched the verge from self-censorship to externally imposed censorship even before the military is involved and things like that. That is the same thing that Szilard was doing early on.

Fall of 1939, FDR says go ahead, start working on uranium, and do it secretly. From the very beginning, FDR is the one who is mandating the secrecy; and that is an interesting and curious point.

1940-1941 not a lot happens with the bomb, as you know. It is a very exploratory program; they call it the Uranium Committee. The fact that they call it the Uranium [02:09:00] Committee is a sign that they do not have a lot of secrecy yet. It is secret, but not super-secret. You can see this in 1942, when Bush, Conant and the other people who take over the project, have sort of a coup of it, it becomes much more secret immediately and they rename it the S1 Committee and that's one of the first things they do is say let's stop saying the word uranium so loudly.

FDR tells them that what he requires is what he calls absolute secrecy; that is even at the time, in 1942 FDR is not thinking necessarily about the bomb as a wonder weapon at this time. They told FDR it is only going to be maybe two thousand tons of TNT, which is big, but it is not these world-destroying proportions. He says still; do not tell anybody about it. The fact that we are even having a secret about it is itself a secret. One thing I have tried to play with in my work is why is FDR saying this? He is making it more secret than radar. He is making it more secret than other secret projects and he is very explicit about this. One of the reasons is because he is afraid of Congress. He is afraid it will be seen as a boondoggle. It is not necessarily just the Germans and the Japanese and all that, but all sorts of domestic concerns for the secrecy. FDR is very aware, and Bush and Conant encourage him in this as well, that this is not the sort of thing that anybody is going to approve spending a lot of money on. It sounds totally science fiction still at this point.

1943 the Army takes over. General Groves, hurray! General Groves ups all the secrecy that they already had in place. So, a lot of the secrecy that we associate with the Manhattan Project, like isolated sites or having compartmentalization, censorship of scientific publications, the civilians have already started doing that by forty-two. In forty-three, it is amplified to very high levels.

Spring 1945, the interim committee, they start realizing we are going to start using a bomb; we might want to think about what is going to happen after we use the bomb. They craft what they call the publicity strategy, and the idea is they will give information out so that information doesn't leak out, and this is where the Smyth Report comes from... from the first official history of the bomb is

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released only three or four days after Nagasaki. He also creates what he calls the Manhattan Project public relations organization, which sounds pretty amusing and benign after the fact. The idea behind this whole strategy is... and Groves is completely on board with this... we cannot hold back the information just by censorship, especially in the post-war regime; the newspapers will not listen to us. What we need to do is give them information, sanitize information and then attach to it a rider that says PS if you go beyond this, we will throw you in jail. That is the sort of method... and I always find that very interesting that there is secrecy through disclosure. That is a very important, early bit and it continues for the Atomic Energy Commission. It is not just complete silence. They know they cannot do that and still use a bomb, because the fact is, once you blow up a city with a bomb, everybody is going to know you were making a bomb.

August 1945, after the bomb is used, Truman continues to urge secrecy. [02:12:00] This is actually unusual, so there's actually an executive order done before the end of World War II, before the bomb is used, where Truman says, at the end of the war, everything that's secret and scientific should be released for public knowledge. All this great science and technology we have acquired, and people actually go to Groves right afterward and say, so does the bomb count under that? And Groves says, no, and he actually gets Marshall and these higher people to exempt the bomb with lots of radars getting declassified. Lots of all these other scientific projects they do, the bomb is treated as a special secret thing for the short term.

November 1945, Groves was under the belief that he could push the legislation; he would not have to worry about the long-term secrecy policy. That would be something for Congress. It does not work out. The May-Johnson Act fails; this is the Army legislation. Groves, interestingly, unilaterally sets up the first declassification organization as a short-term thing. That is not something we normally associate with Groves. The guidelines for declassification were not developed by the military; they were not developed by bureaucrats; they were developed by a team of scientists, chaired by Richard Tolman. The other people on the team are Robert Oppenheimer, Ernest Lawrence, Arthur Compton, Harold Urey, Frank Spedding. It's the top A-List of the Manhattan Project, come up with the first attempt to come up... the entire federal government, as far as I know, with guidelines for how you sift out what is dangerous and what is not dangerous, and whether you rate in favor of something being released, a scientific fact, or whether you rate against it. What things of the Manhattan Project go into categories? They have three categories, one is release it immediately, one is never release it ever, they put the hydrogen bomb in that category, and then in the middle they have release it depending on how the circumstances change in the next five years; so, kind of an interesting thing.

That is very early on, November 1945. At the same time, the McMahon Act is proposed. The Initial version of the McMahon Act is very pro scientists. It has no secrecy of basic scientific information, very limited secrecy for what they call related technical information of how you actually make bombs. It is a very liberal bill. The only section on information is titled dissemination of information.

February 1946, as a result of this, Groves leaks the Gouzenko Affair to the press, pretty good evidence that Groves himself is the one who leaked it. There is a huge furor over Soviet spying in Canada, even though this is actually rather incidental spying as far as spying goes, and it's part of this trying to put real secrecy requirements in place.

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March 1946, Oppenheimer is involved with the Acheson-Lilienthal Report. This is the international control... the early drafts of this report are explicit in that they are not about using secrecy. They actually say in there, "This is not a plan of using ignorance as a means of controlling the bomb. It will not work; we will only do it by focusing on material things, so uranium mines and facilities for enriching them, things like that". That gets edited just before the release of it. They remove the explicit anti-secrecy that was implicitly in there. This is part of a rearguard attempt to get rid of secrecy. [02:15:00]

May 1946 McMahon Act is modified in secret committee. That section that was called dissemination of information is renamed The Control of Information and they add a clause which says that all information about making nuclear weapons, or nuclear energy, is basically considered born secret until explicitly declassified. This is sort of the extreme opposite where if I am a physicist working at a university and I happen to come across new ways of making bombs, it is classified even though I do not work for the government. Even though there is no censor, I am not at Los Alamos and no fences.

And in 1947, the Atomic Energy Commission takes on that and they also adopt all those previous Manhattan Project security policies. So all the declassification policies, all the ways of dealing with clearances, things like that, are pretty much just adopted wholesale by the AEC. These policies and practices start to spread to all other parts of federal government.

Now we are hitting sort of the other thing, 1950 Klaus Fuchs is revealed to be a spy and we got a whole other discussion about secrecy. The secrecy discussion changes from "My God, General Groves is so great at keeping things secret," to "My God, they have all the secrets." It was a total failure, so this is Greenglass, the Rosenbergs, all that stuff comes out then.

Then in 1954, we also have the Oppenheimer security hearing. This is now the really perverse side of secrecy is coming out as part of the discussion. Secrecy is the destroyer of lives, the destroyer of careers. Now, just to move into beyond, I put this in there not because it is Manhattan Project history, but this is the sort of thing we are dealing with today if we are going to talk about secrecy. The 1950s and 60s you have a whole debate over fall out, limited test ban treaty, we talked about that a little today, we have a lot of distrust of radiation, a lot of distrust of nuclear weapons, a lot of distrust of the government.

In the 1970s, you have the nuclear power debate, the nuclear waste debates; you have nuclear terrorism starts being discussed around 1972 after the Munich Olympics. You have people arguing what is known as the Safeguards debate, but there's too much fissile material unsecured in the world and a group of amateurs could make nuclear weapons and blow them up. There are no more secrets anymore as part of that debate. 1970s we also have the Pentagon Papers, Watergate and the Church Committee. The Church Committee is the CIA, Family Jewels, all that awful assassination stuff. This is not atomic at all, but it is a part of a general cynicism about secrecy, a rejection of secrecy comes to a peak around the Nixon era. You have the Star Wars debate in the 1980s, very vociferous, lots of... you guys lived through it; I was just a kid.

[Laughter]

Unidentified Male: Late 1980s, early 1990s you have the end of the Cold War, you have a very strong revisionist streak. We start seeing the Manhattan Project and the Cold War as sort of being a

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big folly, not to use your term Richard, but this becomes a changing of the way we talk about it. In the 1990s we have Wen Ho Lee, which becomes Oppenheimer Part II, and now we have the war on terror 2001, we have an expanding secrecy regime; we have millions of people who have secrecy clearance in the United States [02:18:00]. This is the context in which we are talking about secrecy. There are multiple things going on here beyond just what General Groves was doing that are going to resonate in people's brains.

I want to also just address what we mean by secrecy... what maybe I mean by secrecy. This is one of these terms that everybody uses very commonly but is very rarely pinned down. Democracy is another great example of this where everybody has their own idea about it... freedom... I find this very instructive. It is from the Latin *secerno*, I do not know how to speak Latin, so that's just a guess. The Latin word of the word secrecy and secret is to separate, to part, to sunder, to distinguish, to set aside. It is an active division. It is the active dividing of the world. You separate out things like knowledge, people or places from the rest. You decide who gets to know it and who does not get to know it. I find this a very useful way of thinking about it. It is this division, it's not one single thing.

When we talk about secrecy in the Manhattan Project, it is a cluster of practices. The goal is to enact this division so that we have this knowledge, there is an atomic bomb; and we are building one and it is feasible. We want the practices that will let us divide that fact from ninety percent of the world, especially Germany and Japan.

I just want to give an example of practices. We have all seen secrecy stamps; they are practically ubiquitous in our culture, this iconography of the stamp. The reason we have the stamp is not just to be scary and fun, it is part of an entire set of practices a secrecy regime, if you will. I stamp this paper and that tells anybody else who looks at this paper what they have to do with it. It tells them who can see it. So you have to have a badge, you have to have a clearance to get in there. So we are not only dividing this paper from a paper that isn't stamped like that, we are dividing this person up now into a person who can look at a paper that isn't stamped secrecy. It tells you what happens... what you have to do to keep the paper safe, so if it is top secret you have to have a guard with a gun. It tells you how you have to destroy the paper if you are getting rid of it. That guy has a burn basket, which is such a wonderfully low tech approach to getting rid of things. I really love that aspect of things. And it tells you what happens if you misuse something that's stamped like that. You go to jail or die. I mean, the original atomic energy act had the death penalty associated with the misuse, or even like the miss stapling of restricted data. They took that out after they made the death penalty unconstitutional, and when they redid the constitutional death penalty, they never added it back in, so you cannot actually die from restricted data, except under the Espionage Act, so there you go.

This is what I mean by these linked sets of practices. We have the documents segregation, which is the stamping. We have the marking of the document, we have the personnel investigations that are required to give you a clearance, which manifests in some way you can show it to somebody with a gun because he will not let you [02:21:00] see it otherwise. You have very intricate regulations about where these can be kept; so at Princeton, when they wanted to have Robert Oppenheimer and John Von Neumann and things like that. They had to build a giant safe, it is a safe building and they had to clear it with the Atomic Energy Commission. The dimensions of the safe, and is this actually secure, could a Soviet spy get into the safe? And all of this is consistent with regulations about how you handle these things with the stamps on them.

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And then finally, you have laws that give teeth to all these threats because if I just write secret on a piece of paper, which is what they did in the Civil War, which is what they did in many other pre-World War II eras... World War I is when they started getting very serious about secrecy in the United States, that it doesn't just mean that you're in trouble, or you've done a bad thing. but it has real consequences associated with it.

Now we are back at the stamp again. So what are the practices of secrecy in the Manhattan Project regime? I have listed a few, but there is a bunch of them and I just want to give you a few of the illustrative ones. One is personal security investigations and clearances, so you are classifying people. Who is good? Who is bad? Who is dodgy? Site isolation, when you take critical facilities and you put them where nobody else lives because you feel that makes people ask fewer questions. Physical security... fences, guards, safes... all this is part of constructing a secrecy regime. Document control... these are the stamps on the document. There is actually a really great file from one of the smaller outposts around... I have gone black, what did I do?

Unidentified Female: Oh, I am sorry...

Unidentified Male: I broke secrecy.

[Laughter]

Unidentified Male: I have gone too far, I have said too much. I have a great letter from somebody who was at one of the outposts when the university was working on this and he does not have a secrecy stamp, so he is having to write secret at the top of every paper he writes... every page of his reports, and the last part he says we need a stamp! Get me a stamp! And that sort of... again, it's about the practices, the guidelines of what you do with the document. You have code names, you have purposeful obfuscation [02:23:00], you have indoctrination. You have what we call security consciousness, security culture; they call this OPSEC sometimes, operational security; it is convincing people how to think like people who care about secrecy. This was a very early, difficult problem with the Manhattan Project. It's one of the reasons Groves isolated the University of Chicago very early on because Arthur Compton did not have good security consciousness and he was inviting people to colloquiums who were not yet cleared. This was not acceptable, he did not feel this was an appropriate approach and so he said, okay, you can do that but you do not get to learn anything about making a bomb. Compartmentalization so one guy doesn't know what the other guy is working on even though they are both on the same project. You have this at the extreme level on the production sites where the people have no idea what they are doing whatsoever, many of them. Censorship of media, newspapers, this was voluntary in World War II, they did try to do it with limited success and you definitely have censorship of project personnel, where you're reading mail and not letting them talk to their loved ones and things like that.

You do have disinformation, which is another part of the secrecy regime in the fake press releases they sent out after Trinity. It says an ammo dump blew up and nobody got hurt. They tried to plant rumors at Los Alamos, which thoroughly failed. Then they occasionally would do false denials. When this news of the attack on the Norwegian heavy water plant got out in the world and people were saying, oh, maybe this has something to do with... have you heard about atomic energy... And it got Harold Urey, the guy who discovered heavy water, to write a letter to the editor saying I don't have any clue what this is about. There is certainly no way to use this in war, which is a total lie.

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You have a black budget, so this is one of the first big black budgets, is the Manhattan Project, where they purposely... Roosevelt initially pays this out of a fund that gets no oversight. They eventually bring in a total of seven Congressmen on the Manhattan Project to approve their budgetary requests as they start going up into the hundreds of millions. And then lastly, they have legal means—they have the Espionage Act, intimidation, they have ways of saying look, if you don't do what we say, really bad things can happen to you, and this is all part of what backs it up. Now, these might... there's more you can identify, but these are just a few major ones. This is what I mean by focusing on the practices.

The other thing I just want to talk about is focusing on narratives. I will give three examples of what I mean by narratives of secrecy. There is the initial sort of the atomic bomb is the best-kept secret of the war is what we have all probably seen here and there. That is a manufactured story written by Groves' public relations organization right after World War II and it was originally written to give thanks to the office of censorship for helping censor publications on it, and it just goes wild from there. The basic story is it was necessary and it worked. The secrecy totally was successful and it did not appear in newspapers, is totally false. There are newspaper stories about atomic energy, there are newspaper stories about oh, and the Germans are working on an atomic bomb. There's a really big one from a Cleveland newspaper that says, hey there's this crazy lab out in Los Alamos, [02:26:00] and this guy named Oppenheimer is running it, and some people say they are making a huge explosion and these things gave Groves palpitations. But it was not perfectly secret and in fact, I argue if you look at the numbers and when the secrecy leaks happened versus when the secrecy order was in place, the thing that lowers the number of stories about atomic energy and atomic bombs, has nothing to do with the censorship order. It has to do with taking all of the atomic scientists and moving them to a reservation in New Mexico and they are no longer talking to the press. When that happens, the number of mentions of atomic energy or uranium or all these things that they wanted out of the press, drops almost to nothing, which is where it stayed until the end of the war, with or without the censorship.

That is one narrative of secrecy. Secrecy... bold, important work. Here is another one. Robert Oppenheimer... here is the guy who had all the secrets, everybody trusted him, he was so good and the secrecy system came and hung him by it in the end. This is a very important legacy narrative for the scientists since the Manhattan Project and in the Cold War. It's directly in competition with this first one, it also involves all these questions about espionage, was Oppenheimer a risk more than some of the other people, things like that.

Then one last little narrative, *Surely you are joking Mr. Feynman*. We have Richard Feynman running around Los Alamos poking holes in fences, doing safe cracking; all this... this is the secrecy of the absurd narrative. The secrecy is something that narrow-minded bureaucrats do and scientists, it gets in their way. So if I were to identify a bunch of narratives, we have one that says secrecy is impressive. We have secrecy is totalitarian. I do not mean this like fascism, I mean it penetrates into all aspects of human lives, it controls your families, and it controls what you can tell to your wives... things of that nature. Those are all the secret side accounts; Max can talk about that a lot. Secrecy is absurd, this is Feynman, and you have a variation of this. Secrecy is absurdly totalitarian, that comes up a lot. It is everywhere and ridiculous. Secrecy is counter-productive, so this is Leo Szilard's charge after the war ended that secretly we could have had the bomb even faster if there had not been all this compartmentalization. Secrecy is ineffective. This is a very obvious one post-Fuchs, right? He read all this Manhattan Project, the Greatest Secret ever kept, except that the Russians knew about it before Harry Truman did. Oops. Secrecy is undemocratic, many of the

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revisionist accounts, and they are not incorrect in this, but there is no democracy in the Manhattan Project. Again, seven congressmen and they weren't really asked. They were mostly told. There was not a lot of deliberation in any deliberative government sense, except for the fact that you have said that the president can do all sorts of things in terms of war, and that itself is a democratic conundrum. Lastly, the secrecy is dangerous. This is a very common in the late post-Cold War, especially with regards to the environmental and health concerns, corruption... we have a whole narrative of secrecy, especially in the nineties. We had the plutonium experiments revealed, the human radiation experiments; all these ways in which secrecy was abused, and this is a very potent way of talking about secrecy today, especially in the post 9/11 [02:29:00] period when we have so much secrecy across the board.

So what are the big challenges when we are talking about secrecy? In my opinion, how do we represent physically, the control of knowledge in the culture of secrecy? Matt is going to talk about this a bit. Secrecy is information control. My answer for this is focus on the practices; focus on the things, not so much the big point. Those can come in there, but practices are the way to visualize this, I think.

How do we intuitively illustrate physically, the way in which secrecy affected every aspect of the Manhattan Project? That it's not just, well it was all done within the fence, but every decision, every project... the whole question of the decision to make the bomb was as warped by secrecy as the question of how much radiation... how much they knew about radiation before dropping the bombs or Hiroshima-Nagasaki. Secrecy is at every level on this project. It affects how people talk about it.

Then lastly, how do we balance the competing and contradictory narratives of secrecy? How do we not either make it all Richard Feynman? Ha ha, secrecy is funny because I have safe cracking, but also not oh, secrecy was important and we had to do it, but also not... secrecy was an awful thing that ate people up and spit them out again.

Then how do we address the more long-term legacy? Some of us, when we talk about it tomorrow, we can talk about this here now; but the fact that a lot of the practices of secrecy that we are talking about today within the war on terror, within the expansive size of the military industrial complex, all these things; they were pioneered during the Manhattan Project. Not just the actual procedures, but the mindsets. These fears of existential threats, the language we are talking about and that is all I was going to say. Why don't we turn it over to Mac now?

Mac West: Okay, well then when we need to invert to the next presentation and okay... what I want to address is assets that we have to talk about the idea of the secret city, and just what were these places? I will stress Oak Ridge more than the other two, but what was it like in everyday life for the people who were working on these projects? These were people, some of whom were actually in the production factories. Others were their families. Others were the people who were providing services to the residents of the secret cities. So, we have a rather interesting kind of culture that emerged as a result of this endeavor. And of course, we have heard a lot about General Groves, and here he is... and it was he who was as we just heard, imposing these various strictures on what could and could not be done, said, who could go where, when, how and what was going to happen when they did it. [02:32:00]

The first thing that the secrecy involved was okay, where are we going to do it? And right now, as I said, I'm going to concentrate on Oak Ridge, Hanford and Los Alamos and that Groves put several



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requirements on the sites for these research and production facilities. They wanted to be remote and in places where there aren't a whole lot of people anyway. They want to be inland, so they are safe from attack and less the submarine come along the shore and begin to provide attacks. And they had to be inclement weather, so they can be working year round. Sorry Minnesota, sorry Maine, these are not places we want to do secret projects.

In Oak Ridge in particular, there are three plants going into Oak Ridge and there needed to be natural barriers between the plants. So, if we look at a map of Oak Ridge, what we see, the red dots there... I'm sorry, the scale here is not what I thought we were going to be dealing with... are the plants in three separate mountain valleys and the basic premise here is well, if one of them blows up, it won't affect the other two.

Now, I just want to go back and look at where these were geographically... here is Oak Ridge in Eastern Tennessee, here is Hanford up in Washington, and here is Los Alamos down in New Mexico. So they are widely scattered across the country, they are in remote locations. In Oak Ridge, we have three plants that are physically separated and therefore not able to damage one another. Here is... looking at Y12 in Oak Ridge and we can see the mountain valley that it is placed in such that if you go laterally with an explosion in any direction here, you are not going to affect either K or O with the results of that explosion.

Each of these sites had to develop significant kinds of things. They had to do the activities associated with the Manhattan Project themselves, and then it also had to provide residential and workforce resources for housing, how we are going to get around to the various facilities, and then as Alex was suggesting, how we are going to control what happens as all of these go on.

Building the plants was an absolutely incredible industrial achievement. Here is K25 at its peak, an absolutely astonishing building. I have had the good fortune of being in it. It is no longer, so none of you will have that opportunity again, but it was a mile long and four hundred yards wide, and thousands of identical thermal diffusion units that were just beating [02:35:00] the bejeezers out of those uranium molecules in order to provide the materials that were adequate for making the bombs. The construction that was produced over a very short period of time, was truly amazing.

Then, simultaneously, there had to be housing and services for the people doing the construction, so there were instant cities that came up. Richland, Washington on the right, early picture of Oak Ridge on the left, various kinds of housing and there were some interesting decisions made on who got to live in what kind of a house. As you might imagine, if you were higher ranked, you had a rather nicer residence than somebody of lower rank. You see D and E houses on the left and trailers on the right and here is another part of Richland, and on the right hand side what were called hutments, which were tiny square prefab buildings and we will get at those in detail in a couple minutes. This also emerged literally overnight. Housing for tens of thousands of people, many of whom were brought in from other parts of the country in order to provide the labor force for the several sites.

The one on the right is what is called a flattop and Ken; this is yours on the left hand picture here. If you go to AMSE in Oak Ridge there is a flat top that is accessible and one can go and very nicely see what... this was pretty mid-level housing... what it was like.

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Then security, there were gates. Every gate had a station. You were checked, you had to have your identification, your car was inspected, whether you were going to Los Alamos, Hanford or Oak Ridge, if you were based... if you lived off the base, off the site, you had to go through these gates. If you went off site to do any kind of activities, you had to go through these gates and it was very, very careful security situation. Some of the gates are still there. This is on the Oak Ridge turnpike, and in fact, I recall when I was doing some of my research there, this is now a meeting room; and really, a rather nice little meeting room and it has lots of parking.

Everybody was subjected to security. Here we see a youngster on the right side having his badge checked, and on the left Santa coming in for an event on site having his presents inspected. Throughout these absolutely fantastic security reminders, and how many of these have we kind of worked their way into the legends of the secret cities and then on in to the Cold War? All of the sites were littered with these bill boards that were very carefully reminding the workers [02:38:00] constantly that what they were doing was absolutely vital to the war effort. It was their requirement that they not talk to anybody about what they were doing, including the people they were working with; including the person at the workstation next to them, including their families. Going through... I should stop here and say, many of these photographs were taken by Ed Westcott. I will show you some resources at the end of this, there are some magnificent things online that we can use for this exhibit that talk about daily life in the secret cities, that are really very dramatic and very effective and Westcott is responsible for that.

The daily life involved the work site on one hand, and here we are seeing two of them, the Y-12 calutrons and then the classic picture of the changing of the shifts, and you'll notice that pretty much everybody in both of these pictures is women. There is a bit of a stereotyping of the work that women did in the secret cities. They were not just clerks and mechanical people, but there were women at all levels, scientific levels as well as technical and engineering levels, and they were a vital part of the workforce at the entire project, and particularly these places on Oak Ridge. But there is another aspect to life as well, and that's you've got to have places for your kids to play. We have to get back and forth from the housing neighborhood we live in to the plant that we are assigned to, so there is a very elaborate bus system on the sites and bringing people in from residential areas off site.

Everybody had to have lunch. On the left is a cafeteria, on the right is a local market, and oh look, an A&P, really progressive in those days. But also, had to get gas for your car, so they had to do all of these things that had to do with everyday life. And there were schools. Here we are seeing a basketball team and the cheerleaders in Oak Ridge, so there were all of these aspects of civic life that had to be constructed, maintained and kept secret for the duration.

There was a very well developed library system, including mobile libraries, and on the right hand side is the orchestra, so people had ways of entertaining themselves and providing leisure activities on site for their colleagues.

I rather like this pair of pictures. The chapel on the hill on the right was one of the centers of religious activity and on the left... well, remember, this was a dry state, but if you look on what is on the shelves of that store, and there were certain liberties that were taken if you happened to be on site. Meaning, you could get all the booze you wanted. [02:41:00]

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Here's a hutment outside on the left, and inside on the right. Here is another stereotype story here in that the African-American employees in the secret cities were relegated to the most lower level housing. It was frequently the case, but certainly not entirely the case. There were African-Americans at all levels of employment on the sites. As we look at the secret city story that we want to tell as a part of this exhibit, we have to be careful that we look at the social structures and organization of the Manhattan Project as a business. How women and minorities played multiple roles; and were not restricted to the very, very lower levels of employment and housing.

At the end, finally we have been hearing a lot about those significant days, we found out what we were doing. We found out that we actually did build the bomb and the war was going to end. But for that duration of the development and production of the facilities and the equipment, this was not known exactly how we were going to wind up. But great celebration as you might imagine when this was revealed. The aftermath, the secret city finally opened and the public was invited in. the laboratory, the national laboratory system evolved from those plants that we showed, like K-25, and we are now looking at the DOE's cleanup and reconfiguration of the site. Something that I found as I was doing my work at Oak Ridge, was I looked at the period from 1942 to 1945 as the beginning of the Manhattan Project and the Manhattan Project is still very active and the technological and scientific results of the Manhattan Project affect us in so many ways every day of our lives.

Here is a celebration in 1949 of the formal opening of the secret city. Oak Ridge National Laboratories became the lynch pin of the National Laboratory System, which is now all over the country. I am sorry, this is not readable from this distance, but you see the spread of the National Laboratory Systems and the influence they have had on the late twentieth and twenty-first century science and technology.

And then what is happening with the facilities, this is K-25 a while ago. It is not there anymore, and unfortunately, the ability to do more on site interpretation in this absolutely incredible facility is totally lost for the future. We tried very hard to convince the Department of Energy that this was a national asset.

Cindy Kelly: We should recognize Larry Lee from the Park Service who wrote a magnificent twenty-five page paper urging the Department of Energy not to tear it down.

Larry Lee: Hi there, I still have some faint hopes that what is called the Tech End, which was the very tail end, south east end of the building, which is still there, because some technetium ninety-nine radiation contamination... I still have some long shot hopes that we may be able to retain an aisle of that. It does not have the operating floor problem that the north tower did where a guy fell through it...

Unidentified Male: That is right there.

Unidentified Male: ... because of some other things that were done, the experiments ended up with all the Tech 99 contamination, put in the new floor up there. But that's not part of the historic fabric, so it's not a big problem, so we still hold out some hopes, so write your friendly DOE secretary and congressman and tell them that all of it doesn't need to go away.

Unidentified Male: Okay, and then there's some absolutely terrific resources about the secret cities, some of them produced by people here. Alex, we are going to make this list available... Then

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toward the end here, you see what is going on. The files that are produced by the Manhattan Project Preservation Association, photography of Ann Westcott, which is accessible through the AMSE web site and then the voices of the Manhattan Project, which are the Atomic Heritage Foundation's very, very interesting initiative to do first person interviews of Manhattan Project veterans. There's some absolutely stunning conversations that are taking place there.

Unidentified Female: In cooperation with Los Alamos Historical Society.

Unidentified Male: Okay.

[Laughter]

Unidentified Male: The point of making this for this exhibit, we have some excellent resources for helping visitors to the exhibit understand the nature of the secret city, the lives of the people who work on the project, the families of those workers; the challenges they faced, and the very creative ways in which they addressed those challenges. That is it, I think.

Nope, one last thing, for the purposes of looking at current approaches to the Manhattan Project, we do have several different existing museums, several of them on site [02:47:00] or adjacent to the sites, that we can use. Several represented here at this meeting that we can use as resources, as well as potentially as test sites for some of the activities, or some of the programming that could become a part of this new exhibition. Now I am done.

Unidentified Male: Can a traveling exhibit have a hutment? Is that physically reasonable? A small house?

[Unintelligible] [02:47:41]

Unidentified Female: Oh, recreation.

Unidentified Male: They would not take up much room.

Unidentified Female: You have to house your exhibits in something; you have to set the scene some way.

Unidentified Female: That is a really good idea.

Unidentified Male: Somebody mentioned worldwide interest in these sites, so I'm just wondering about...

Unidentified Male: Wondering about how the secrecy compares to other nations with the bomb and how they maintain their silence. The Soviets, France, and England.

Unidentified Male: The United States, their nuclear secrecy has a very just reputation for being very extreme, but internationally, I think the United States is much better than any other nuclear weapons power in terms of what they disclosed about their programs and access to records and volume of materials. Even sensitivity materials, and I think it is also worth pointing out that as far as weapons of mass destruction go, nuclear is by far the most transparent in terms of how much is

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declassified. If you try to work on chemical weapons or biological weapons, it is just like nothing. They will not... it is still absolute secrecy. They are not going to let you talk about it, so it's actually better than it could be, and there's many more... it's one of the reasons that the stories of the bomb are so dominated by the American account. There are so many things to start with, whereas the French program, there's almost nothing on the French program. China, good luck, right? Russia? A little bit after the end of World War II but not nearly, the Russians are very good about publishing things about the American program that would still be classified in the United States, which that is convenient. But you know...

Unidentified Male: Are these kept for national reasons, or is there a genuine concern about proliferation of information in dangerous ways that maybe... I mean, how do you... what is your value scale for better or worse on these things?

Unidentified Male: They can certainly be a lot that release that did not compromise. I just do not think these places have the same presumption for the most part, with the UK as maybe the exception, but presumption of openness and I do not say that as a rah, rah go America. We have lots of secrets obviously, but we have FOIA, [02:50:00] we have mandatory declassification reviews, we have history departments that push to get things released and I don't... China does not do that. I am not criticizing China, but that is just not the culture. The Russians did not even announce their own tests. They certainly are not going to be the models of transparency.

Unidentified Male: I have a couple of things, but one is a question to help me with the panel I am going to be on tomorrow. Help me understand why secrecy was an integral part of Manhattan Project. How is that different from secrecy that has been going on at least since the Romans? There have been cryptographies around for maybe three thousand years. There have always been military secrets about troop movements; there have been secrets about weapons. What changes with the Manhattan Project? Is it simply a matter of scale? Is it a matter of resources devoted to it? And then I guess, well tomorrow Professor Lawrence and I are talking about security state that goes beyond just the Manhattan Project. But what is the... in fact, is there really an infection point here, or is this just simply continuation of the kind of secrecy that surrounded radar and submarines and the big cannons of World War I and germ warfare?

Alex Wellerstein: You always have secrecy of some sort. With any kind of government, you have diplomatic secrets; you have discretion, things like that. In the United States, you have no secrecy laws on the books until the early twentieth century. They cannot put you in jail for releasing information except in the context of very specific wartime maneuvers. So if you go over and you are a spy, they have laws... they have ways of disciplining spies during wartime. There is nothing civilian, there is nothing other than military regulations until I think it's 1911, and even that is very weak. It is not until World War I that you get real serious... that's the espionage act and all that sort of thing. The first laws that are focused specifically on technical warfare type of information, so weapons... and that is somewhat reflective with the history of technology in the United States. They start getting very leery about submarines and they start saying, my God, what if we could... what if we invent the next submarine and the enemy gets it and somebody mentions actual classified here... we kind of did invent the submarine and we were not interested in it at the time, you know the Civil War and all that.

What you get though with the Manhattan Project in particular, you have a level of secrecy that is very wide and it is specifically covering basic science and technology. We are not just talking about

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the specific wartime maneuvers [02:53:00]. It is a type of secret that does not necessarily expire. I am going to invade Normandy on D-Day. The day after D-Day, that fact is no longer classified. The military maneuvers are temporary secrets by definition because at some point they run out.

Science and technology, how to make an H-bomb, that never runs out if you are worried about people making H-bombs. Lastly, the scale that was retained after the war was unprecedented. There are these wonderful pictures of the FBI's wartime personnel division which they stored in the DC armory over to the east of us, which is now a roller skating rink... massive building... and it's just full of file cabinets and in World War II they are processing millions and millions of personal security things for the war consulate. After World War II they stop doing that on the scale because they scale back the war. They start declassifying radar. They started declassifying all these other things, and then they do not declassify the bomb and part of that is because it is the ultimate existential threat. It does not... the threat does not in their mind go away. So that's kind of special. There is a continuance; you have George Washington doing very secretive things in the Revolution, there is no doubt. But the way in which it's handled with the bomb is unlike any other weapon at any scale. You have some cryptography secrets that date earlier, but they are much more small scale. You do not have an entire industry being declared secret and was kept secret when they declassified nuclear power in the fifties and things. But the idea was that this entire new sector was never going to necessarily be released and that's unusual. Except for the fact that now, we have lots of things like that in this country.

Unidentified Female: How far then to the present do we trace this new culture of secrecy? Do we do it up through today, through the Cold War or just the Manhattan Project? That is something will need to be decided for a national traveling exhibit.

Unidentified Male: My argument would be for today, not only because it's interesting and important, but also because that is again the framework that they are going to be visiting it from and they are going to want to know. That is going to be in the back of their head.

Unidentified Male: And the other thing when you are talking about scale, you look at a bridge, you have seventy-five thousand people, so you are looking... and they are civilians. They are not government workers, they are not military, so when you look at scale and you look at that much secrecy, that's... and we have grandchildren from people who worked there that said their parents still would never talk about it. So they carried it with them to their grave.

Unidentified Female: I want to thank both the presenters for really interesting talks. They are both really important talks and I especially appreciate Mac, the focus on what was it like to live in these worlds. People who come there think fifty-one percent of the population is women. They need to be drawn into this also by looking at what it was like to organize family life in these kinds of worlds. For kids too; what was it like to be in these kinds of worlds? I think that is really [02:56:00] important and really a fascinating part of the story.

And in the written work, I thought it was also very interesting to ask about what it was like to live... have secrets in families, because people also had to do that and that was not easy for them. The celebratory moment is not only a moment of celebration for the nation, it is a whole different way of being able to be related to each other suddenly, because you now know what you've been building and what mommy or daddy has been doing during the day.

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Unidentified Male: That is still in effect. That secrecy between families is still in effect.

Unidentified Female: I agree, which is why I think it is also important to draw that up to the present. I also think the other critical part, just in thinking about social responsibility, is that that kind of secrecy set the tone for how people should act around these issues. The very dark days that followed that, cemented that idea into place. There were secrets; there were things that you could be caught out even inadvertently if you were not smart enough to figure it out. That layer of secrecy, the normalization of secrecy, and I think what you also have in the paper that said less about was, about the organizational system of secrecy. It was not just follow X rule; it was a need to know. This continues into the present. I think that is important and relevant for all kinds of debates that people will be coming to these museums thinking about and knowing about these exhibits that are traveling. So, I guess I want to say, I thought that was really interesting set of information overlaps with some of the many things that we have been talking about here. It is really encouraging to think about how to bring it up to the present.

Unidentified Male: Well, it certainly is an initiative in the museum world today for finding ways to make exhibits regardless of the topic, to make them relevant to real people. That was my rationale for going into the Westcott photographs and the daily life and all of that, is that we all have to live in a house. We all have to buy food. We all have to do various things, and here is how they were doing it under this circumstance. Therefore, I can resonate with the life of that woman, the life of that child, in ways that we would not with just kind of an antiseptic history.

Unidentified Female: And some of those women are also scientists or working during the day and those other kinds of things too and I really appreciate drawing attention to the multiple roles, the multiple kinds of people played in this because that is such an important part of the story too. Women play multiple roles, Native Americans, African Americans... so I just want to applaud the richness of those presentations.

Unidentified Male: Thank you.

Unidentified Male: In your statement, there was not much going on in 1941...

[Laughter]

Unidentified Male: That may have been relative to what came later, but yeah, they are doing lots of work, they are exploring, they are researching, but they are not building a [02:59:00] bomb.

Unidentified Male: No, but in terms of the secrecy... I mean, that may be true for the United States, in England everything was happening. You have the Frisch-Peierls Memorandum in March 1940 and then setting up the MUAD Committee and then the MUAD report and it's very interesting the MUAD report, which was sort of this strategic document about how you might build a uranium bomb in particular, was sent to Washington. Because of it, the atmosphere of secrecy was set with the Uranium Committee, a man called Lyman Briggs [PH] who probably put it in his safe and did not show it to anybody else. It was not extracted from his safe until Mark Oliphant [PH], who was one of the members of the MUAD Committee, came over here to talk about developments in radar. But was so alarmed by the inertia that he engaged and actually went out to recruit Ernest Lawrence and bring him back to Washington to get the Americans to take this seriously. He was actually told that Congress would strike a special medal for him after the war, which never happened.

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In the meantime, the M UAD report had been leaked to Moscow by John Cairncross who was a civil servant in London. It was very well received more than it was over here.

Unidentified Male: Yeah, you are right. Very American account of the Manhattan Project on many fronts, actually. It was the British who were really against releasing the Smyth Report and there is actually a wonderful quote by Chadwick in one of these discussions where he says, well, “We just wouldn’t have to do that over here. Our press knows its place”. Yes, I agree.

Unidentified Female: Another question too is how much do we get into the espionage and what did the Soviets know? That is such a popular topic among the public. On our web site, one of the... I think the second most popular article we have ever had is on the Rosenberg trial. That is not a focus of our work, but that is what everyone wants to read about.

Unidentified Male: As a key point on the security thing, you will know the last of the north part of K25 gaseous division plant came down just a couple of weeks ago. The site, all around there during the demolition, and even now, is still classified Q. There is... the stuff that was in there that would be sensitive, generally was as far as I can tell, completely contained within other things, but some of those were still around and we might have missed one and somebody might [03:02:00] trip over it, kind of thing, so the entire site, even now is Q.

Unidentified Male: I went through that screening process.

Unidentified Male: Yeah, and it just... it is more than slightly bizarre at this point.

Unidentified Male: Just to clarify, Q is the level... top-secret level for restricted data and nuclear stuff, so it requires a big investigation.

Unidentified Male: Barium material is still classified isn’t it?

Unidentified Male: Yes.

Unidentified Male: And of course, K1037 where they made the gaseous diffusion barriers for all the plants is still totally closed. Even people with Q pretty much have to have a need to know to get in there now. We have it on the list of things to be preserved, which they’ve agreed to, documented, and it will be interesting to see how long it takes for them to actually let us in there.

Unidentified Male: I just wanted to pick up on Kelly’s point, and yours. I think a very good way to bring this exhibition home is by showing some of the domestic life part of this. That is something people can relate to and there is an irony about this. As I was reading and writing about this place, they were trying to create a situation of normalcy in these places, when in fact with Oak Ridge they were trying to create a garden city out of this thing. the irony of that is you’ve got this huge plant in the middle... you’ve got this thing of death and destruction and a garden city with green belts and playgrounds and that kind of thing. It was very much on the minds with Skidmore being involved and all.

Unidentified Male: The early version of the shocking center.



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[Cross Talk] [03:03:50]

Unidentified Male: ...but that was all part of the amenities...the communities were set up this way and... Greenery... it was like Greenbelt except it's got a uranium plant.

[Laughter]

Unidentified Male: Groves collected rumors about the sites that were circulating around them and one of my favorites was... the rumor was the Oak Ridge was meant to be a prototype for Eleanor Roosevelt's socialist utopia.

[Laughter]

Unidentified Male: One of the domestic anecdotes for Mac, which I got from Ari Schapiro he came to work at Los Alamos but they all shared the same PO box address, which was 1663, or whatever it was, Santa Fe. Of course, there was a fantastic number of pregnancies and children born in Los Alamos and they all used to order bassinet's from Sears. Sears was just dispatching bassinet after bassinet to this PO Box in New Mexico and just could not work out what was going on.

Unidentified Female: They actually cancelled the catalogue. They said we have sent more than four hundred catalogues to one PO Box, [03:05:00] we do not think you need any more.

[Laughter]

Unidentified Male: PO Box 1663...

Unidentified Male: You guys have been in such good agreement and we are sort of lacking the controversy that we had in the last part, so let me offer some. Here is a proposition; I went to a lecture by Phil Morrison somewhere in the 1970s at Berkeley. He did a series of lectures that were fabulously good lectures. One of them was about secrecy and the Manhattan Project and he went over what was known to basically every physicist in the world, what the engineering issues were, which were not... didn't require fundamental breakthroughs, it was just a matter of brute force and how big an industrial plant you need to make bomb material. He stood up at the end and said so... and by the way, Phil Morrison standing up was a production... he had to get his canes... but he stood up because it was such an important point, he said there was really only one secret. That was the secret that the bomb would work; that you could build it, and it would work. And once that was known, there was no more secret. If that is true, then a lot of this effort... not wasted, but particularly after Hiroshima, it should not have been that important any more. And that the Russians and anyone else who wanted to, could make a bomb then. If you plugged away at it hard enough, if you put enough money into it, it would happen. So, is that a viewpoint that you think is valid enough to put in the exhibit? And how would we deal with it?

Unidentified Male: I would do it as a historically-contextualized thing. This was a very common viewpoint by the scientist movement immediately after. It was one of the big arguments against the May-Johnson Bill, which they thought the McMahon Act would get rid of the secrecy and it is an interesting argument. It is again related to this Acheson-Lilienthal report which is there is no... if controlling the information will not guarantee you a monopoly, then the only way that you can keep the bomb from everybody having one is to do real international control, which is controlling

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facilities and having inspections and not letting anybody have the uranium mines and things like that, and aka the NPT, but in 1945 more or less. In a sense that they mean there is no secret, but that the bomb exists, it is a very limited sense. What they mean is, anybody who works at it long enough, as you said, can get one. [03:08:00]

That is, of course, not how somebody like General Groves understood the question of what they were keeping secret. He understood it as how much time until they get one because they are going to try to get one, and I don't trust them enough to international control. But one thing that's quite interesting is that even the people at the top like James Conant and Vannevar Bush, these people are very administratively involved. They are against long-term post war secrecy too, in part because they are in favor of international control. When they are drafting... they were very heavily involved in drafting this first Army legislation for domestic control of atomic energy, the May-Johnson Act, and Conant... they have almost nothing in that bill on secrecy. It got the reputation of being very secretive, but the original bill just says yeah, they AEC can make regulations to control information if it feels the need to, and this was very vague, obviously. It is incredibly vague, and Conant, in drafting this, says well, we can include that in there, but we are not going to need it in the post war because we are going to get rid of the secrecy anyway. So, even though guys as high as James Conant, is not expecting permanent long-term secrecy. At Chicago, they are doing studies on how should we control secrecy, how should we control the bomb. They are not assuming that what happens is going to happen, and I think that is actually something that does need to be introduced into an exhibit.

The people of 1945 who are planning for the post war are not assuming that the status quo is going to continue. They are expecting something very radical is going to change. And there is a change, but it's not nearly as radical as they thought. Even Oppenheimer and his committee, when they come drawing up the list of what should be secret, their mid-term category of what should be secret for eighty-five years at the most, depending on the political situation, includes things like implosion, how to separate plutonium out from reactor products; things that are actually kept secret for quite a while after that. The fact that nobody knew what they were doing is something that I feel is very important to bring out. They are grasping around in the dark as to what to do with the bomb afterwards and the question of secrecy evolves very dramatically between 1945 and say 1950 when things get very cemented in after all the focus on the H-bomb and that kind of stuff. But it's still really at play in the early period and I think that's worth bringing out. That is the Phil Morrison point of view. These people did not expect, and did not want secrecy and they fought very hard against it, but failed.

Unidentified Female: The other... that part of the story about the formal rules and about what the expectations were also in the context of something that is happening around the United States, which is that people are attacking other people, looking at them in suspect ways because they may have secrets. There are security investigations with fifty percent of the people investigated by some of these state committees are scientists who are seen as suspects. Jessica Long's book, I think nicely lays out what those consequences are. So even without the formal systems, [03:11:00] that are special just to scientists or special to the Manhattan Project, there is a set of activities, which are formal political activities, putting people under scrutiny. One of the levers that they try to use is that there are secrets, even though lots of other people are talking about what secrets. These things are already out; they are circulated. We are trying to control this in a particular way. So I think the intersection of those two worlds provides some complexity to what was going on. Again, because I did the responsibility part of it, it also really... people are scared. They are afraid to participate in

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public life in particular kinds of ways. They are terrified about this until after 1956, after the election when things lighten up a little bit. Even so, in 1957 and 1958, there are attacks on the Committee for Nuclear Information. They are gone after by all kinds of people. When I first started my research, I went to the National Archives and I could not get the papers from CNI because they are all secret, secret, classified, classified, classified, classified. I finally found some... I do not want to report the person, but he was like, I do not know, they do not seem secret and he just started giving me stuff. I was at the photocopier immediately. I think part of it is that there are certain rules for them; scientists know that there is no getting away from this. Understanding that, in that broader context of civilian life and political life, I think would also help people to understand what people were up against and what they were trying to do in being responsible, being scientists and trying to figure out, could they participate in things like controlling this stuff.

Unidentified Male: The classic case in a way is Oppenheimer's security hearing because when he had his clearance lifted, he was basically out of government. He was no longer able to do what he tried to do before. Secrecy as a weapon destroyed him somewhat politically.

Alex Wellerstein: There is a great quote that one of Mordechai Vanunu lawyers... Vanunu is the Israeli whistle blower on their nuclear program, and he described that when secrecy touches something, it spreads. It is contagious. You can say that in a non... it doesn't have to imply bad motives, but when you decide... I mean the Manhattan Project is a great example of this. We have one secret; it is that we are trying to build a bomb. So, from that we also know well, you can't know what's going on in this plant, you can't know what you're working on, you can't tell your husband... it starts to spread. All these things are going down the rabbit hole to protect this one little nugget at the bottom. But the layers are removed so that the amount of toilet paper that was necessary [03:14:00] for Oak Ridge is classified because that tells you how many people worked there. If you know how many people worked there, they know what the budget is. If you know what the budget is, you know how important it is; and down and down and down and down.

Unidentified Female: That is like how much water is treated at the radioactive nuclear waste treatment plant in Los Alamos because people can back engineer that to how much plutonium is made there.

Unidentified Male: Right.

Unidentified Female: It is like the story you have on your blog about they tried to outlaw spheres at Los Alamos.

Unidentified Male: Yeah, there's this great story in an actual technical document that spheres are classified shapes, right because they are the cores of bombs and they were having trouble cleaning up the classified areas for visitors because they were like, is this a bomb shape or is it an ashtray? An honest to God problem, so they passed the policy that all spheres were considered classified upon entrance of the technical area.

Unidentified Male: That is like the classified value of pi.

Unidentified Male: They actually had a guy who gets in trouble for like leaving an orange out, you know his lunch. He probably got in trouble for this. Joe Masco writes about this; and in a way the secrecy is an absurd narrative, though there is logic to it. These guys, the security people are

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not... they take it seriously, it's just that this is what happens when you run through the logic of it, especially when you're subjected to human error and mistakes that are made and things like that. I talked to some security people and they are like everybody makes fun of us and I understand that and I get why they are frustrated. They get frustrated... it is so easy to get in trouble when you are a security person. You declassify stuff and you declassify the wrong thing and my point, I keep trying to make is; it is not because these people are incompetent. They may be. It is not because they are bad. They may be. It is because of what happens when you scale things that are inherently problematic over huge numbers of individual decisions. Of course, there are going to be problems, contradictions and exceptions.

Unidentified Male: Here's sort of the international service this exhibit could do if it does include these elements of picking up from Alan's point, is that it really makes a very clear alternative between this kind of secrecy regime and the international control of these things. It explains a lot of what is going on today and for people to realize this may be the only way to contain these kinds of things. You can't do it by secrecy, you really have to take seriously the international control regime to make these things happen... as what's happening in Iran... I think this may be a real service for this.

Unidentified Male: The IAEA does not look for information leaks. It does not police publications. NPT says nothing about information specifically in it. There is a very big handbook that the IEA, I do not think purposely published, but it is on the internet, for all the things that you should look for in looking for a nuclear program. They did this for Iraq, DOE helped them with it, and it is on the internet. There is only one category of this million-page handbook, and it has all of these little detailed things. If you are looking for pictures of things that you probably should not find pictures of, you can find them in this handbook out there... diffusion plants, things like that. The only category for information is, they have a thing that says, nuclear weapons testing results. So the codes that you get from doing nuclear testing, that is considered very sensitive. They have a picture and it is like it's a floppy disc. Now, how do you find that? How do you identify that lying around an office? Literally, a floppy disc picture, but the whole emphasis again, goes back to the Acheson-Lilienthal report. It is on stuff. Knowledge is very hard to regulate.

Unidentified Male: How much of this is about economic control?

Unidentified Male: Early on, it is important. They are actually very concerned with post-war economic issues about nuclear power. They are very suspicious, no offense, with the British. They think the British only care about this for industrial things. They think that the British only want to get a leg in because they want to make all these nuclear power plants and have straight control of this new industry. But by 1955... 1954 they partitioned their understanding of secrecy in a way where they can say there is some stuff that's really safe and some stuff that's really dangerous. Reactors are now suddenly in the safe category even though previously they were considered military technology, let's just declassify a whole bunch of stuff. This is I how we get to this whole debate we have today about are there any secrets left? This is the safeguards debate of the 1970s.

If a reactor handbook tells you enough physics to make a bomb, which they do more or less, Cameron has written on this, then what is the point in keeping anything secret at this point? We should be focusing only on highly enriched uranium and plutonium stockpiles.

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Unidentified Male: We worry so much about a terrorist getting a sophisticated bomb, when a crude one will do.

Unidentified Male: What is the value of assassinating scientists, nuclear scientists?

Unidentified Male: Well, there's a long conversation we could have about whether... the theoretical value is that it's not just about information, it's also about people. This is in some ways a very science studies point but... It is a tactic Israel has used with some efficiency in the past for other non-nuclear things, but... scaring... if you get enough scientists who don't want to work on a project, it does slow things up. That is the Israelis; I am not saying it is a good idea to assassinate people. There is a lot of blow back.

Unidentified Male: That was a Manhattan Project [03:20:00] precedent to it. General Groves wanted to go after potential German scientists and he even sent Moe Berg... the famous Moe Berg, great catcher... baseball catcher... to sit in the audience in Zurich to listen to a presentation. His orders were...

Unidentified Male: Heisenberg...

Unidentified Male: What did I say?

Unidentified Male: You did not... Heisenberg...

Alex Wellerstein: Werner Heisenberg was allowed to give a lecture in Zurich, and so he goes out of Germany and into Switzerland and Moe is in the audience with a gun in his pocket and cyanide pills also. His orders were, seriously, that if there was the least suspicion that Heisenberg was about to divulge something about a German bomb, he was to get up and shoot him. He did not; and there were other opportunities that evening at dinner, and a walk on the street in which Berg and Heisenberg were together, but anyway... this was General Groves' way of slowing down the German bomb program. He had other means, bombing laboratories and...

Unidentified Male: That would have been a dead giveaway that other people were interested.

Unidentified Male: Yeah, sure.

Unidentified Male: And the Norwegian sinking of the ferry boat with the heavy water on it, and the bombing of the factory... and so there was an early on precedent that "got to stop those Germans one way or the other, and this is the way we are going to do it."

Unidentified Male: A great story of secrecy in the war is that a couple of the Soviet scientists realized we were working on the bomb, because all of our nuclear physicists stopped publishing papers.

I have a related question that I think might fit into this whole business. It is not really about secrecy, but after the war, there was evidently a very generally accepted belief that there was not a lot of useful uranium ore in Europe. As a result, they were not going to waste any on nuclear power. Indeed, there was a point where the AEC was considering using coal fly ash, which concentrates uranium when it has burned up, to extract uranium for bombs. Has anyone come across that? It is a

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wonderful museum quality story if it is true. Then they discovered all the riches of the Colorado Plateau and they were okay after that.

Unidentified Male: Well, it is not that rich. They had to artificially double the economics, set a false price [03:23:00] of uranium in order to make it... so yeah, they believed that there wasn't much uranium in the world and in a sense, they are right. I mean, there's very low concentrations of uranium all over the place, but just to give an idea... the Belgian Congo ore that they were fortunate enough to get very early on. Of those rocks, it ranges between about sixty-five percent and eighty percent uranium in the rocks. These are big green crystals. They are very juicy. The Colorado Plateau uranium is... to be economical, I believe their number was something like five percent, so that would be five percent of actual uranium actually embedded in these other minerals and it's a dry, yellow, dusty piece of rock. It does not look green or juicy or anything. The Canadian ore is about that, three to five percent. There is Australian ore, which is maybe a little bit higher than that I think, but most sources in the world are very much lower than that five percent economic value. The Soviet Union did not have great sources either, but they did have slave labor, so they made very good use of very low levels of uranium. That is kind of a problem. Groves banks on the Soviet Union not getting a bomb for twenty years, and he does it because he bought up all the known uranium sources at the time.

Unidentified Female: I want to add to the historical source that might be useful for people is Gabrielle Hecht's book on being nuclear Africans in the global Uranium trade because she is tracing this back to the period... this precise period. Then looking at the ways in which that uranium circulates, does not circulate, the imagined ideas of where it is too. and also just in reference to the question about where we have lots of information or not... her book on being nuclear, which is... excuse me, the radiance of France is another source that also at least provides a kind of contrasting story. I was thinking earlier about some of the documents that the people who do museums presented to us in our first presentation too about how to make these things local and verbal. There's a lot of mine fields, no pun intended, but mine fields we walk into with some kinds of internationalism, but it might be also useful to even think about well, where did this stuff come from to make this happen or that happen. What were the questions about the circulations of things and thinking about its circulation, the blocked circulations, where those materials might be useful and that Gabrielle might be somebody who could be helpful in thinking through some of those habits... about some of the sources of uranium.

Unidentified Male: Ultimately, we are looking at natural resource use and I think that is an excellent point. These are not something that a physicist snaps his fingers and a molecule appears. There has to be a source of materials, and as you were talking about, there is an economic reality associated with the location, the distribution, the percentage of [03:26:00] the desired chemical. Yeah, that is an excellent point.

Unidentified Male: And the political consequences: we were buying about half of our uranium supply from South Africa and therefore letting them proceed with the apartheid and all the rest of the horror down there for a long time.

Unidentified Female: Wasn't the... am I mistaken about this, but the uranium used in Hiroshima was from Niger is that right?

Unidentified Male: It was from Shinkolobwe, Congo. The Belgian Congo.

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Unidentified Female: But that's also...

Unidentified Male: Yeah, yeah, it's its own other...

Unidentified Female: The whole thing is sort of dug out of the mountains in New Mexico or something. It's helpful to know about these circulations and...

Unidentified Male: And it makes this also a really global—I mean it keeps it from being a national story also. If you really spend—I do think when I teach undergraduates where I show them the state of nuclear fission research in 1939 and I have a wonderful table set up in the Deutsches Museum in Munich of the Hahn, Meitner, Frisch, Stresemann experiment and it fits on a pretty good sized dinner table and that's nuclear fission 1939. Then I show them that map of all the Manhattan Project sites and as we all have heard this quote as Niels Bohr famously said, "I said you would have to make the entire country into a factory to make an atomic bomb, and that's exactly what you did." That's the scale that I... you know it's an entire industry.

Unidentified Male: Along the same lines, Chadwick's original apparatus, where he discovered the neutron is about smaller than coconut.

[Laughter]

Unidentified Male: Goudschmidt, after the war, in one of his books said in 1945, what started out as a tabletop ended up an industry the size of the U.S. automobile industry. People are really startled when they hear that number, so if they have some sense of how big the automobile industry was...

Unidentified Male: One thing I've looked at in some detail is the Manhattan Project patent policy, which is a whole story I don't want to get into, but they file patents on every single component of the bomb project. Any new invention, they filed a secret patent in the government's name and if you tally up all the patent applications they had on file by the end of the war, it's one percent of all U.S. patents in 1945, which is... part of that is because there weren't as many patents in 1945 as there were previously because everybody is at war, but still, it gives you the size... this is an industry. It is not a... he's not building a bomb, Groves... he's building a bomb production industry.

Unidentified Male: Do you want to add the Hirshhorn Museum to this? Didn't he make his money in Canadian...

Unidentified Male: Oh, I don't know.

Unidentified Male: All the linkages we can draw.

[Cross Talk] [03:28:52]

Unidentified Male: Kelly found very complimentary presentations here with... I learned a lot from Alex's [03:29:00] presentation and Matt really turned it into the way it could be used as a museum exhibition. I think we had a good conversation. I have one other thing to say about these different narratives.

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I think one of the most destructive things that happened recently had to do with Senator Kyle. Here we are churning away in the archives with people declassifying documents, never reaching their exact goals, which they have set for themselves. Nevertheless, they are churning away using the classification guides, so on and so forth, and out of the war on terrorism and all the rest of it here, along comes Senator Kyl from Arizona who thinks that perhaps some restricted data might have been released here. But everyone said think of the weapons in Germany, which is basically restricted data. So they have to go back and redo all of these declassified documents, which is totally moronic because many of them have been out there already and they are already used. But it slowed down the declassification process immensely. We are still not out of the hole from the mischief that he caused in all of this. so, thankfully, he's retired now and can no longer bring about such mischief. But in terms of secrecy... it filled several of Alex's narratives of being absurd, counter-productive, totalitarian, ineffective, undemocratic, dangerous... I think that will probably... not to put too fine a point on what Senator Kyle did, but that is what he did.

Really, I thought that was a very good discussion this afternoon and I learned a lot and I think it helped our cause here.

Unidentified Female: Just by way of illustration, I have a question for the group here; and that is when you move to a new community and you have introduced yourself to people, what is one of the first things you ask them?

Unidentified Female: What do you do?

Unidentified Female: What do you do? When you move to Los Alamos, probably Oak Ridge and Hanford I would guess as well, you do not ask people that question. So, that's kind of that culture of secrecy is still out there and it is very complex and I think Alex really did a great job of illustrating that with all of his different issues.

But talking about absurdness, I think you will all get a kick out of this too. How many of you have read "Rider of the Pale Horse," by McAllister Hall? He was an SED during the project, and then went on to become a physics professor and retired as the head of physics at U of M. he wrote a book called "Rider of the Pale Horse." He had several illustrations in it, and we did a display on his illustrations [03:32:00]. Two of them, I had them up in my museum, and when Linda—we sent [03:32:07] did an exhibit over there; she could not display those in her museum because those illustrations were still classified. So there is some absurdity to this that lends itself to laughs and Alex and I were talking earlier about if you can make your audience laugh they are going to remember a little bit more. So that is a good thing to point out I think. There is some absurdity to this.

Unlike the other topics that we have discussed today, the decision to drop the atomic bomb on somebody, this one actually lends itself very well to museum illustration. We have an exhibit in our museum called Life in the Secret City. Like the ones from Oak Ridge with the Westcott photos, we have the kids in school, the ladies hanging clothes out on the clothes lines; we have the birth certificate where the child was born at P.O. Box 1663; we have a license plate that doesn't have a state, doesn't have a county... all it is, is a number. We have driver's licenses that do not have pictures or names, and so there are great ways to illustrate this, to really show people what it is like.



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Alex, Matt, Joe, and I talked about this on the phone and Alex's point is, the thing about it is its very appealing to people. Everybody wants to be in on the secret, and we cannot romanticize it because what you do end up with is this huge black budget of billions of dollars. Where is it all going? People need to understand that aspect. It is not cute. It is not funny. It really becomes a big national issue. So, I think we need to certainly talk about it and make sure it doesn't get romanticized. We need to illustrate with the daily life and we need to illustrate it with the political end of things as well.

Unidentified Male: Political and economic.

Unidentified Female: A related issue, and it's something I want everybody to think about, is the lack of... It partly relates to the secrecy in the most common people. Women do not have any or much of a grasp on these issues, and in fact they are intimidated by them. I heard Congressman Rush Holt, who has been the lone physicist for some time, I guess there was another one from Pennsylvania, but I do not think he has been there for a while. At any rate, he represents Princeton and I heard him speak once about how his colleagues on the Hill are never shy about talking about all sorts of complex subjects... taxation, welfare, budgets... but they always defer to him on anything to do with nuclear weapons as if it is just so impenetrable. That is, I think, one of the products of our secrecy [03:35:00]. We have been told this is impenetrable, not something to be discussed or understood.

Maybe through this exhibition, we can chip away a little bit at this myth that this is appropriate for civil discourse. The idea that to challenge the fact that these illustrations aren't appropriate to be shown to the public... I remember when Dick came up to Los Alamos for a book signing and the lab museum...the Bradbury... said he can't sign it on our premises because there are things in his book that are classified. There are just crazy things, but nobody is challenging them. People do not understand the absurdity of the situation and the depth of it and the cost of it and the cost of our society of it. If we show them, I guess we will get into this tomorrow, but Alex alluded to the arsenals of folly, to quote your book title, so how did that happen? How did we get in this situation? This lack of transparency and the whole intimidation of a nation even talking about this, or raising questions and the congressmen... oh no, you take care of that, we don't understand it. If we can do something in this exhibit somehow to get these issues on the table. We will not get any federal funding again.

[Laughter]

Unidentified Female: And this exhibit will not come anywhere near any museum associated with a federal facility. Actually, I wondered earlier today, what kind of museums do we envision would take this exhibit? Is it for a science museum? Is it for a history museum? Or are there a couple different flavors of the exhibit? You would pitch it differently, and it is a different audience that expects things differently in those two different kinds of venues. Just wondering if that has been given any thought.

Unidentified Male: I think you have to go through this exercise in general in deciding what your main audience is for this exhibit. At some point... certainly children are part of this; youth are part of this story... very interested in formal science, learning...

[Cross Talk] [03:37:46]

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Unidentified Female: Does it go to the Bellagio gallery? You know, it is sad...

Unidentified Male: Would they have a party?

Unidentified Female: They would.

Unidentified Male: But I think that is a very important consideration. [03:38:00] We are in an enviable situation right now in that we are still puffing things up and looking at what our options are. But as this project moves forward, these are questions that have to be well-framed and there has to be some serious analysis of what is the market, or what are the markets, depending on how this wants to sort itself out. It has to take the form of a marketable product for some segment, or segments of the museum industry, if it is going to make any sense at all. We spend a lot of time, my company, looking at the traveling exhibitions world, and it is going to be interesting. I think it probably would be worthwhile doing some research on what is selling now in the way, particularly across disciplinary exhibits. One of the things that... Alan can speak to this as well, but what I think we are seeing more and more of is museums de-siloing and realizing that there are various aspects of the human endeavor that... art, history, science... are not these isolates, but rather they are interdependent and they cross-fertilize. But we absolutely need to be strategic about how this emerges as a product that goes onto the open market.

Unidentified Male: Thoughts Alan?

Alan Friedman: Just yes. This is a crucial factor, it is an economic factor, it is a matter of the audience we want to have. I do not have any easy answers for this. I can imagine a museum like the one I ran for twenty-two years, depending on how much it costs and how big it is. That is a really serious debate. One issue, for example is that the science technology centers, which are the fastest growing and the most popular, a huge part of their audience are school-aged children. Will this be a draw for them on weekends? Will this exhibit bring in school classes? It might, for example, do particularly well for high school students, but they tend not to come to these centers. So then, we are looking at places like the Museum of Science and Industry, the Franklin Institute that have world historic components. They even have historians around. Those would be the natural people, I think, to want this; are there going to be any hands on components? Are there going to be dialogues with the public? Something like those, what did you call them, the circles? [03:41:00] I think all these will determine whether it fits in with the current persona that each institution is trying to project. So it's no longer an obvious thing. If you build a really good traveling exhibit, you get booked up forever. The economics of the field have changed. A number of institutions have moved away from blockbuster exhibits towards things like maker's fairs, which have very low capital costs because people just come in, volunteer to set up tables and do things. I do not think this should determine whether such a project happens because we know this is an important story. We know this is a story the public needs to understand because of the world they live in. so we need to do it anyway, but exactly how we do it, how big it is, is a crucial question. There is a penalty for being too big in terms of how much space you take up in an institution. Big museums, like the ones in London or Paris, or the American Museum of Natural History, size matters because they only have so much space to devote to temporary exhibits.

A lot of research and this is something Matt does, into what is the ideal size for this exhibit, independent of how much stuff you have to put in it. if you want to get it seen, what's the upper

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limit of size, and what's the lower limit, both to say the important things you want to say, and to make a big enough splash so the host institution will spend money marketing it.

Unidentified Male: And the other thing is, we have talked a lot about tying things into how they are today. Well, today, tomorrow is not relevant anymore, so if you look at what it relevant to today and then five years down the road, when you finally get this thing built and it's been toured for five years, it's ten years old. So you have to be careful with that as well.

Cindy Kelly: I don't know what the market is today, but I have been working on this sort of a Guinness Book of World Records, how many times can you pitch a traveling exhibit on the Manhattan Project?

[Laughter]

Cindy Kelly: I am really doing well. The first time around it was the National Science Foundation, the next three, or was it four, I have forgotten... it was the National Humanities. At any rate, it is a tricky issue and getting better. Our exhibit proposals are getting better, but I was amazed that the museums that I called to say [03:44:00], because you know you have to look like it's all done. You have the walk through, and then you have the schedule, and I had to make up a schedule as to when the exhibit was going to be and where, call these museums, they loved it. It was easy to sell. Of course, I didn't say put the money on the barrel head, but in abstract, there was a lot of interest and it was very easy... I was able to get the Boston Museum of Science and Ft. Worth-Dallas and Exploratorium and so forth and so on.

Then we conceptualized five thousand square foot and a twelve hundred, so the smaller version was popular in the abstract in Atlanta and all sorts of military museums in Georgia... Atlanta wanted the big thing I think. The New Orleans Museum, World War II Museum they wanted five thousand square foot. It was... the abstract was very popular, it just did not get past peer review committees because they do not like the Manhattan Project. It was a poisonous issue. So we have to call it something else. But with your help we have to figure out a way to sell this.

Unidentified Male: What don't they like about it; just because it sounds war like or something?

Unidentified Female: There was one person, and the person at NEH told me this, he said do not tell anyone I told you, because he sat in on the review committee. There was one woman who said, "I do not care if they had blacks in the Manhattan Project, it was immoral." Period. End of discussion. If you get anything less than an excellent these days, you are out of the running. In those days I might have even gotten some funding, but it went down to... somebody gave... I cannot even remember, but that was issue one.

Another person I made the pitch, that this is a time when Saving Private Ryan was out, the World War II memorial was just opened, Ambrose had forty-five books... best sellers on World War II and I cited all these things just to say there is a lot of national interest in World War II. The reviewer said... she says that the applicant claims there is a lot of interest in World War II; but what does the Manhattan Project have to do with World War II? That was the review.

[Laughter]

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Unidentified Female: I went to all my representatives about this to ask them about their support or not and just to see what they would say. So I wrote to everybody in the State of Illinois and the dominant answer that I got back is that they are concerned that there's not enough diverse [03:47:00] points of view represented, so I was trying to figure out what could that mean. Your point of view, or whose point of view? So I did have some phone calls with the staffers, but I thought that was kind of an interesting argument that people were saying about why we don't want to spend federal money on this unless it has these diverse points of view. I could not get a handle on what that would be.

Unidentified Female: I will bring a book to dinner tonight that the lab has just published on thirty-six homesteaders that were at Los Alamos before the Manhattan Project and they all got kicked off their land. It is a wonderful publication that has beautiful history and should be a huge part of the story. The same thing happened in Oak Ridge and Hanford—there were communities there that got kicked off and those peoples stories do need to be told.

Unidentified Female: Joe Masco book tells some of those stories. Nuclear New Mexico, it tells some of those stories too.

[Cross Talk] [03:47:55]

Unidentified Female: We have begun to collect stories of Hispanics who worked on the Hill, or worked at Los Alamos and African Americans who worked at other parts, Hanford and the Manhattan Project...

Unidentified Female: We found one picture of one African American SED and I think he is the only one; and the military was not integrated then, so it must have been somebody who was majoring in physics or chemistry, and that is why he got pulled up there.

Unidentified Male: There was a draftsman at Los Alamos, I don't know if it was him, but somebody e-mailed me once and said my father was an African American draftsman at Los Alamos and had to be shipped out there. I do not know if that is... that is one of the few that I have heard of at Los Alamos.

Unidentified Male: The assumption on the part of this reviewer, this was going to be a celebratory exhibit, so that is one side you are dealing with. On the other side, you have people thinking it's going to be a negative exhibit, so navigating that middle ground where you try to teach the history of science and that kind of thing, while at the same time talk about social responsibility is... it's a pretty narrow line to run, but it's such an overwhelmingly important subject.

Unidentified Female: We have to figure out... you hate to be crass and say all right, we are going to put in here all the wonders of nuclear medicine and go after the nuclear medicine companies to get that funded. I think Jim Walker [PH] at the National Nuclear Museum had found that he has to do that. Nobody wants to fund history. When the companies want to sell their stuff, they will fund those modern day wonders that result... and that is how his exhibits go in two directions. The Bomb and that history, and then sort of... and you know that is fair, that is good because there were two... avenues for peace and avenues for war. It is hard to get money, very hard to get money for the history part. [03:50:00]

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Unidentified Male: I got huge pressure with the Manhattan Project to put things in the show on nuclear medicine and this kind of thing... isotopes and stuff, so yeah, we will have to fight that battle.

Unidentified Male: Nothing wrong with having some isotopes in there if you put a ten percent surcharge in order to do the history as well.

Unidentified Female: No, you can do that. Some people will have a special part of an exhibit that costs more, so if you want to get at what does it feel like to be in a centrifuge... I do not know...

[Laughter]

Unidentified Female: Then you charge twenty dollars for that part of the exhibit.

[Cross Talk] [03:50:58]

Cindy Kelly: Well, I think on that note we should probably close for now and thank our presenters for an excellent session.

### **Second Day of Workshop**

#### **Introduction**

Moderator: Okay I think we better get going. We're going to be on a fast train today. With your permission we are going to try to compress the schedule a little bit. We've got some flights that got cancelled and rescheduled hours earlier that we're trying to accommodate. So we -- I definitely want to get to the recommendation session -- session. Several people have recommended instead of having small groups and then reporting back and such; we'll have one group that will stay together, focus on the issue of you know, what should be the parameters of this national travel exhibit. Since we could do an international exhibit that starts in—well, I'm being silly. But anyway there's so many things on the table that would be very helpful as an outcome to have your advice on okay, what really makes sense, what's the audience, what's the size, what's the strategy? So that will be -- I think I'll start that right after lunch; will you all be here right after lunch? Okay.

The other goal is -- is maybe we can shave a little time off these morning discussions so we have lunch at noon and then maybe shave lunch from an hour to 45 minutes and then try to get everybody together and maybe finish around 4:00. That maybe too early, 5:00 is okay; I don't want to -- because Angela is our speaker and we're not going to short change her. But at any rate we'll just make sure we get that recommendation session right after lunch.

I'm really so delighted with yesterday's discussion. Some people say, you know, told me they thought it was great but how do we do it for second day? At any rate, I am fully confident that we have all-star cast this morning starting with Robert Norris and Alan Friedman talking about the manifest security state. Now Alan why don't you take my seat here so we can get your face.

**[Presentation: The National Security State by Robert S Norris and Alan Friedman](#)**

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Robert S. Norris: Well I'm going to start here largely -- you have copies of the paper I wrote and largely I'll be reading and paraphrasing that. I've argued that General Leslie Groves was an architect of what became known as the National Security State. That phrase attempts to define new governmental departments and agencies that have emerged in the aftermath of World War II and evolved throughout the Cold War and the procedures and practices by which they operated.

These features include the wide spread concern for security and secrecy, compartmentalization as an organizing scheme, [00:03:00] black budgets, the reliance on intelligence and counter intelligence and the interlocking relationship of government industry science, the university and the military. All of them first emerged during the Manhattan Project.

Groves is not often thought of as a contributor to modern intelligence practices, but his widespread views of compartmentalization as an organizing principle was novel and significant. He implemented it on a scale not previously seen. Its primary purpose was to enhance security, but as a consequence it was also the source of his power. In government bureaucracies, especially ones heavily involved in secret -- with secrecy knowledge is power. And by knowing more one is able to shape the substance in place of a policy or project.

From the moment Groves took control a top priority for him was to establish and maintain a security system that would break no violation of secrecy. The most important single secret about any bomb program is the fact that it exists. Just as the most important single danger to any bomb program is the possibility and enemy will build one first. This meant that the project had to be cloaked in utmost secrecy. If the Germans had even a hint that the American's were involved in making progress they might begin a program to build a bomb of their own, if they were not doing so already.

Second if the enemy knew of the atomic project it might find a way to sabotage the effort and delay progress. Finally secrecy was essential to ensure maximum surprise when the bomb was ready achieving shock that could cause the enemy to surrender. With regard to secrecy in the founding matters Groves listed the following major objectives. These are Groves objectives now with regard to secrecy and I think tie into what Alex talked about yesterday.

1. To keep knowledge from the German and to a lesser degree from the Japanese.
2. To keep knowledge from the Russians.
3. To keep as much knowledge as possible from all other nations so that the United States position after the war would be as strong as possible.
4. To keep knowledge from those who would interfere directly or indirectly with the progress of the work, such as Congress and various executive branch offices -- this is Groves speaking now, those are his words.
5. To limit discussion of the use of the bomb to a small group of officials.
6. To achieve military surprise when the bomb was used and thus gain the psychological effect.
7. To operate the program on a need to know basis by use of [00:06:00] compartmentalization.

As he said, and this is a quote from Groves, "Compartmentalization of knowledge to me was the very heart of security. My role was simple and not capable of misinterpretation. Each man should know everything he needed to know to do his job and nothing else. Adherence to this rule not only provided an adequate measure of security but it greatly improved overall efficiency by making our people stick to their knitting".

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Now Groves took this to heart himself and probably the most surprised person overall on August 6 was his wife and daughter who didn't know about it. In my book there's a picture of Mrs. Groves and daughter Gwen reading the newspaper because the journalists rushed to the house and my caption is here is his wife and daughter learning what the head of the family had been doing for the past three years, which they -- they were oblivious about.

Unidentified male: He was protecting her, wasn't he? And her as well as the country?

Robert S. Norris: Yeah, I mean she had no need to know. She wasn't told anything. It was quite a surprise at the end. Now I mean this kind of behavior continues today especially in Washington. I mean you're often at a dinner party and ask your neighbor a question, "What do you do" and they say, "I work at Langley" or perhaps Fort Meade and you know, that's it. So the proper response to this is, "What did you think of the Redskin game last night"? And on you go to dinner so this continues within families today and is part of the culture of Washington.

It is a fact that prior to the government imposition of secrecy the scientist were the first to censor their work about the atomic bomb. From the moment the fission was discovered many realized that weapons of enormous destruction were possible some scientists were concerned that discussions of the physics breakthroughs and technical advancements in journals and at conferences might lead others to try their hand at making a bomb. As Enrico Fermi said, "Contrary to perhaps what is most -- the most common belief about secrecy, secrecy was not started by Generals. It was not started by security officers but was started by physicists". And the man who most -- who was mostly responsible for this extremely novel idea for physicists was Szilard". Leo Szilard and a few of his colleagues pleaded with physicists in America and in Europe to refrain from publishing new studies on the aspects of fission. [00:09:00] But with the cat out of the bag physicists around the world instantly recognized the military potential of discovery.

Only in the United States was there fully mobilized effort to develop tests and use the bomb. The German program was halted at about the same time the U.S. program was being launched in the early spring of 1942. And the Soviet program was modest during the war until Hiroshima when Stalin ordered a full scale effort.

The Manhattan Project epitomized the contradictory tension between the openness of science and the necessity for secrecy of military projects of national security. It was a clash of cultures. Science and openness versus military secrecy and order. Groves wrestled with this throughout trying to both advance the pioneering scientific aspects of building a bomb, while maintaining the highest classification possible. Scientists had to follow his procedures for compartmentalization. They could not travel to the different sites without his permission. Oppenheimer got Groves to agree to scientific interchange behind the fence and isolated Los Alamos.

After the war these procedures would become institutionalized as scientists and science was recruited to fight the Cold War. From the late 1940's onward the Soviet Union and communism was invoked as the rationale to justify the procedures and practices of the national security state. After 1949 China would be added -- would be an added justification. Others have recognized the transformation that occurred as a result of World War II and the aftermath. Jerry Wells in his book "Power the Modern Presidency and the National Security State" locates the roots in the Manhattan

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Project and the main architect as General Groves. His focus is how the bomb contributed to the growth of executive power. In short the so-called imperial presidency.

After the war there would be many projects in which science was harnessed to advance the national security state. The term "Big science" would be applied to some of these. CERN, the Hubble Telescope, the Ballistic missile program, reconnaissance satellites, DARPA, and the internet, the drone program are a few that come to mind.

Where are we today with regard to secrecy? One account is presented in Dana Priest and William Arkin's book *Top Secret America, the Rise of the New American Security State 2011*, which assesses what has happened the decade after September 2001. The U.S. government embarked upon unparalleled effort to protect America. Currently over 850,000 have top secret security clearances. More than 1,200 government organizations [00:12:00] exist across America to find and capture terrorists at home and abroad. A private force of nearly 204 corporate contractors has made billions with the bill paid by the American taxpayer. The national security state is alive and well and is larger than ever.

Let me just close with an advertisement for my Federation of American Scientist colleague Steve Aftergood whose daily blog, Secrecy News is essential for keeping track of developments having to do with secrecy and the government. Thank you.

Alan Friedman: Okay good morning. If you could put my slide up. So in one sense this -- this is an easy one. Of course it's not but let me tell you why it ought to be easy. How do you exhibit secrecy? Of course you don't exhibit secrecy itself; you would just have a blank paddle in the museum that says, "This part of the exhibit is secret". But even if you did that people would line up to read the small print if there were any. And that's because we are all just fascinated by secrecy.

And in fact to quote "Everybody loves to learn a secret". That's a direct quotation from yesterday. So I'm just giving a few examples here, the secret war about drones in Afghanistan. That was one of the top rated public television programs of the year. Going back to the secret agent, Joseph Conrad, those of you who know that novel; it's one of my favorites. It's not a secret agent in the traditional sense but it is indeed an anarchist who plans to blow up the Royal Greenwich Observatory. And I have written about that as one of the first examples of a metaphorical connection of science, secrecy and warfare in literature. Secret of Stonehenge, the secret garden if you just Google the Secret blank you'll never stop. And of course several million mystery novels and spy stories, all of which are about secrets. Some of the real secrets, some of them invented secrets. Almost all of them [00:15:00] with various lessons to derive; usually the lesson is keeping a secret is doomed and dangerous and it damages everybody including the person who is trying to keep the secret as well as people he's trying to keep it from, he or she.

So that's the easy part that almost anything we do with the word "secret" in it is going to be successful. The catch is just as described yesterday this is not a simple secret; this is a complex interesting fascinating and highly consequential series of occurrences that lead to the national security state. How are we going to do this? Well you just heard a brilliant less than 15 minute exposition. So we got to get Professor Norris to come and stand in our exhibit every day and say exactly what he said and that was I think at a level that anybody, any lay person could understand. You didn't have to be a historian or a physicist to follow what was going on. And it's filled with drama. The fact that we all laughed at the fact that General Groves was going to protect us from the



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Congress and the President of the United States and the Germans all in one fell swoop by making this secret so no one could interfere with his device to save us and civilization.

These are great stories. How do we tell them? Well there are a couple of possibilities. The first thing you think of in doing an exhibit is we need physical artifacts. People like to look at stuff. If we just put words and pictures and graphs on the wall, well we should have written a book, okay? And in fact, Robert Norris has written a book. So just go read the book, never mind the exhibit.

We still want to include this as part of our exhibition, how do we do it? So let's take a look at secrecy in various format presentations. Michael Frayn's, "Copenhagen" those who've seen it know it is all about secrets and two people trying to communicate with each other, Eisenberg and Bore. And not quite communicating so it's really a puzzle play and you're left not knowing what each one was actually trying to say to the other.

The enigma machine, I know this was a top secret machine but every museum in the world seems to have one. They're a lot left lying around the German submarines and military offices. [00:18:00] There are many of them often with sort of minimal interpretation; there's the machine. This was vitally important, learning how to decode this machine saved tens of thousands of lives, changed the course of the war with no further explanation.

Once again books are probably the best way to do this. My favorite World War II science book is Harvey Jones "The Secret War", which was called the Wizard's War and published here; just an incredible book, it reads like a novel. And good guys and bad guys on both sides, actually Lindeman is the bad guy in most of this one.

Well what objects do we have in science and American life there's a wonderful panel of ID badges, one of which was Klaus Fuchs with no further discussion which makes it just delightful. And I bet that if you stood around you would find people discovering that and telling their friends what's going on.

But this isn't so much about objects; this is more I think about motivations, ambiguities and consequences. So in fact I would think this would be a marvelous opportunity for using dramatic techniques. I can imagine for example, a section of this exhibit which you have what looks like a briefing room with World War II era furniture, a hard metal chair and that sort of thing and you have a video -- high definition video with professional actor playing Leslie Groves giving a briefing explaining to his inner most staff why he's imposing these rules and what they're intended to do.

I can also imagine a portrayal either by live actors or on video of Groves arguing with Oppenheimer about this policy and how they reach an accommodation. I can imagine putting this in a little earlier context of the point that the initial idea of scientists keeping secrets trace back to Szilard and there was a famous exchange by telegram between Szilard and Pierre Joliot Curie fondly responds, "I've considered the question, my decision published now" and that was the end of Szilard's effort to create this internal security state within the physicists.

So these are dramatic opportunities. We could also do one to even broaden this. One of the most interesting stories to my mind is I think still [00:21:00] not totally clear because I've never seen documentation but Churchill apparently deliberately withheld enigma data, data from the top secret decrypting of the German submarine data. And let them sink some ships killing hundreds of people

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rather than let the German's know that we had broken the code. Because as long as they kept using the code and the allies could break it we could protect the most high value cargo and people.

Unidentified male: And the bombing of Coventry --

Alan Friedman: Yes apparently he knew of Coventry through these decrypts and decided that the danger, the loss of life, the loss of everything and Coventry wasn't worth giving away the secret that we could decode because there were other things for which he could use he decoding .That would be a dramatic discussion. I don't quite know how you would do this again with a panel display. I don't know what objects we'd use except an enigma machine, but clearly it's a dramatic. So the one set of examples I have of how to portray this using mixed media some dramatic recreations, some artifacts, a fair amount of text and images in the wall is just a stone's throw from here. I thought I had it, there we go.

At the museum and how many of you have been to the museum? Okay, almost everybody. I thought they did a really splendid job and they set it up primarily as a confrontation between the heroic journalists and everyone who didn't want them to have information. So they have to dig out information; sometimes it's not that there's a hostile force. It's just that the information is lying there not knowing they have to root it out. Other times the deliberate attempts to suppress information or to plant information. So the exhibition in the upper right about J. Edgar Hoover and the FBI and the media is a story of both the FBI withholding information and planting information sometimes false to try to get journalists to help some campaign that the FVI was engaged in.

So it's set up again as a confrontation, which does make good drama. But in this case without any dramatic components it's done by showing new stories that were planted in fact and contain [00:24:00] deliberate errors in it. In other cases in which Hoover is trying to sabotage journalists who've wrote a story he didn't like or didn't want or that they have uncovered against his desire. I think we could present some of the same uses, same technique to talk about the rise of this state and to show how it goes beyond. The museum does a really good job of taking this through history the long panels on the left take a couple of themes and run them from pre-revolutionary war days right through the present. And again one of these themes is secrecy versus journalistic.

Now being that the museum is the museum and is about news, the journalists are almost exclusively the heroes and everybody else are the bad guys and information wants to be freed, that's more of an internet age expression. But it makes for dramatic story. And so I think absolutely we should include the rise of the security state, its origins both the prewar but especially the Manhattan Project role and then its extensions. That's it.

Unidentified male: Now Alan as you're talking about that I'm struck with what we're getting in the news right now with the cyber-attacks on the Washington Post and the New York Times; is this a direct continuation of what you were saying the museum is doing?

Unidentified male: Yes.

Unidentified male: Those are probably from foreign power also; aren't those supposed to be from China?

Unidentified male: China; right.

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Moderator: Carla?

Unidentified female: I have a thought about something else that could go in this exhibition maybe, especially for younger visitors. If compartmentalization is the building block of secrecy why not set something up, and I don't know exactly what, so that a group -- maybe a school group coming some people -- some kids would know only some piece of information and other kids would know only a different piece of information and work out an educational program for them at the exhibit to show how compartmentalization would lead to keeping secrets.

Unidentified male: I think that's a great idea especially then they can meet and piece together their --

Unidentified female: Yes.

Unidentified male: Of where the treasure is buried or the secrets.

Unidentified male: And that's been brought up several times about how compartmentalized things were so you have people that are taking different paths along the exhibit and then at the end they all get together and talk about what they've [00:27:00] learned on their path.

Unidentified male: But all of them are violating the rules.

Unidentified male: Right.

Unidentified male: And Groves would have taken care of that.

Alan Friedman: This is probably not easy to implement in the museum setting. The best example of that kind of activity was an exhibit called, "Mind Games". One of the most fascinating exhibits I have ever seen. It was at Science World in Vancouver, British Columbia and the -- it was a science and engineering project. You went around and you gathered data of where you would locate a nickel mine in Western Canada. And when you had gone through and you'd gather some data, you've got a clipboard, you all met together and all the people had been in the exhibit for the last half hour were invited to sit down around a big circular auditorium, not that big. I mean big circle and put your information together and try to figure out what the best site was and everyone had different information to contribute.

The dramatic way in which that was presented was once you had reached a consensus in your little group and you were guided by a moderator a video came on showing the reaction of mine owners, native people, newscasters and labor unions. The -- the environmentalists and whatever decision you came about where to put the mine everyone was outraged. And then you were given the opportunity to rearrange the information so that you could mollify some of these.

Unidentified male: That's great.

Unidentified male: That was done on video.

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Alan Friedman: Exactly and it was the same notion that the engineering, the data and the scientific data take you only so far and then you're going to have to bite the bullet and make a decision and that's where you leave yourself open to the bay. This was extremely difficult to organize how you swept people up at the right time, got them together in a room, the skill required of the staff person to conduct the argument without heat, but an argument nevertheless. And eventually they stopped doing it. But I saw it and it was absolutely stunning and gave you a picture of how science interacts with society that most people have no notion of.

Unidentified male: Maybe just to build on the Carless point and maybe I could make a quick comment here without putting the poor children in jail here that violated the compartmentalization. Perhaps you could have kind of a pyramid and at the bottom breakdown the population of the Manhattan Project and down at the bottom are [00:30:00] all of the workers who really didn't know what they were working on and they performed various tasks and then just have the different layers, smaller and smaller groups of people who knew more and more; who knew where the sites were. And at the very top are, you know just one or two people and maybe that's a visual way of seeing what -- what was in reality the real situation in terms who had knowledge of what.

Unidentified male: That with pictures that would be --

Unidentified male: Yeah.

Unidentified male: Sir is the place to put the espionage on --

Unidentified male: I'm sorry?

Unidentified male: Is this the place to put the espionage segment because that's the flip side of secrecy, such original and compelling story and people have always been intrigued by it.

Alan Friedman: And again, to go back to Alex's point yesterday which maybe what -- I didn't finish up as a reflector has done. Did secrecy work? And today I listed the objectives that Groves had and we could tick off whether or not they worked or not and one that didn't work was keeping information from the Russian's. We did keep information away from the German's and the Japanese, apparently there's no evidence that they ever knew about it. But there were a few leaks with regard to the Russian's.

Unidentified male: With the espionage aspect you've got a lot of interesting artifacts right down to the little box, the two pieces that match supposedly. There was involvement and the curious fact of the real spies were really never identified during the war up until after the Rosenberg's were put to death.

Unidentified male: Who is in charge? Andrew.

Unidentified male: Alan I'd like to pitch you a new play to be written by Richard Groves with four characters, General Groves, Niels Bohr, James Chadwick and Joseph Rotblat.

Unidentified male: Oh God.

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Unidentified male: Rotblat was the only outsider in that he wasn't a naturalized American and didn't hold a British passport and was Groves was persuaded to accept it by Chadwick. Groves was so interested in him that he actually met him in New York first, which I think was a relatively unusual for Groves to meet a young scientist on the way in. In New York Rotblat buys a short wave radio which he takes with him to Los Alamos and there Spore and Rotblat can listen to the radio because they can get the European news coverage of the progress of the war. And during these efforts Spore I think rehearses a lot of the arguments he's going to put to Churchill when Roosevelt unleashes Rotblat as a sounding board. [00:33:00] You then have a questionable dinner party where Groves comes to dinner with Chadwick and within Rotblat's hearing says that the real purpose of the project is to subdue the Russian's, not to defeat the German's. And later on there is the questionable departure brought back from the project while he was under a cloud of suspicion with almost suggesting that he's a communist and thus break security.

Unidentified male: Who would they be casting this?

Unidentified male: Carrying baggage; he comes back to the east coast and Chadwick puts him on a train in Washington with a big trunk full of all his personal belongings, some boots and everything. When he gets to New York the trunk is gone and no one ever knows what happened to it.

Unidentified female: Well somebody is going to find that out some day.

Unidentified male: That will be huge.

Unidentified male: If the issue of an exhibition or a presentation is to extend beyond a history lesson, to draw conclusions in today's world. Particularly when we talk about the espionage aspect of it we have to be a little bit sensitive that there's a balance that needs to be achieved. I've been working for the past year and a half on curious presentation that national security agency is trying to do that has involved from an attempt to explain to Congress the threat of cyber -- cyber-attack balanced against the public good of growing cyber community. And the first approach that they developed on this was terribly threatening. The conclusion that you would reach from this was -- was a real shut down and the -- the attempt now. There -- there sort of in another phase in this is to present this in context so that they're message, the security message is actually near the end of the overall presentation. It begins much more of a context of public good, the growth of the cyber community where it will be headed, how it will serve in a positive context. I don't think we would want those to go through an exhibit or through a presentation that has them conclude that there is -- that there is danger and that there is threat, [00:36:00] and there is subversion in science here. That somehow or another we have to pull the public good side out of this throughout the course of the presentation. Espionage always works; I mean God knows the spy museum is making a lot of money. There's no question.

But is that -- is that entirely the message that we want to get from this. There's still public good thread as regards to science that has to emerge from the way we present it.

Unidentified male: One thing that makes the espionage slightly more complicated then sort of it's an awful threat is if you go into like why is Fuchs doing this for example? Why was he a spy? And it's not because he's you know, mean or colluding. I mean he actually has what can look like a rather noble motives as long as you're not General Groves, right? His motives are the world is a

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dangerous place, the Russians are dying by the millions to help win this war, they should be in on it and the world will be more stable if everybody has this technology as opposed to just one super power. And that's not the worst argument unless you're the super power who otherwise would be the only person having it. And then it's a big traitorous awful thing, "I can't believe he did it".

It's -- it's a different sort of spy thing unlike the altered Ames sort of thing. The later you're like selling people's lives for personal gain, which then Fuchs got nothing out of the spy. They never paid and I don't know if the Rosenbergs got paid anything. But like Harry Gold got nothing out of his spying and all these guys are ideological.

Unidentified male: It still speaks to control; it still speaks to control of science. And so maybe it's not so much the espionage issue as it is the control versus openness needs to be conveyed -- what does that mean for science? What does that mean for growth of the enterprise?

Unidentified male: Again that's why this isn't a simple story. And even the -- the non-wartime -- one of the things about the double helix was the story of how Watson and Crick actually spied on Pauling to find out what his structural solution was. And it had nothing to do with national security; it just had to do with wanting to make the discovery first. So we could put this in many context, I think we should have a big enough problem just putting it in the context of the special circumstances of the Manhattan Project. But I agree with Bud we don't want people to walk away thinking that science is all about secrets and espionage and we do need to show that the motivations here as Alex just said, there are really no evil actors here that we're talking about.

Unidentified male: I mean you talk about the tension that's going on because it's not -- the community does not want to have at this point so I think you could --

Unidentified female: Speak so you can be heard --

Unidentified female: I'm not sure whether you'd want to take this line but one of the things that the government would say about secrecy, scientific secrecy is that it hurt the progress of science. So you know clearly [00:39:00] to with -- to have information about basic physics not be in the public domain was to slow the progress of other kinds of discoveries. And I mean I think that notion that science always kind of wants to be free, that it's always good for information to be free is naïve. I mean the double helix shows that in fact scientists in all fields, not fields far from classification selectively obtain and withhold information to their element. But certainly in the area of nuclear technology, you know one of the costs to the U.S. policy and secrecy was to really inhibit commercial development of atomic energy. So in that sense the national security state really trumped all other concerns and it put the EAC in a very difficult position because they were always under pressure from you know, conservatives to show that they weren't being -- that they weren't -- that it wasn't a socialist's monopoly. That they were allowing free enterprise, but in fact the national security restrictions really inhibited commercial involvement so that's the other, you know down side security is not just its effects on people's lives, but also the flow of information through society, which can have other benefits.

Unidentified male: You know this would make a great exhibit all by itself. I mean that's precisely the point that you're referring to this balance of public good and growth and security.

Unidentified female: Yeah.

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Unidentified male: Cameron -- you're supposed to formally reflect or something. In looking at your list of Groves objectives he succeeded in keeping the information from the Russian's and perhaps the British and the French and people need to know his program was largely successful. And it always astonishes me and I hope this is something that can somehow be brought to the people is how remarkably small his organization, this project was. Can one imagine the folks that work for governmental agencies; can one imagine operating such a project now with such a small staff? How many committees and oversight boards would be involved; it just astonishes me how tightly he succeeded in doing this.

Robert S. Norris: There's never been any -- what was then called the new war department and today it's the old part of the state department on the fifth floor. There's a suite of offices currently occupied by the person who's in charge of arms control and disarmament by the way, which I think is appropriate. It's rather ironic but sort of has a nice -- no it was accidental and a couple of years ago I got a call from the assistant secretary and she said, "I'm reading your book" and I said, "Good, good". And she said, "I think I'm in Grove's office". [00:42:00] So I said, "Yeah you probably are, why don't I come over". And I went over and sure enough that's -- I had been there before researching the book and we located the office; it's slightly different. And then what that led to was Cindy's efforts in conjunction with the state department to put a plaque in those offices to remind everybody who worked there what went on. So if you have a chance to visit over there it's -- you know again we're talking about going to places where things happened. That -- that was it. His desk -- that was the center of the whole thing with a tiny suite of offices and a tiny group of people, with a secretary and a couple of others he said he wanted to follow the example of General Sherman whose headquarters were an escort wagon during the march to the sea. And he just about qualified in keeping a small staff.

Now of course under him was the Manhattan District in Oakridge -- first in New York and then in Oakridge, Tennessee which was gigantic and overseen by Colonel Nickels. Go ahead Cameron.

Unidentified male: Szilard was initially the champion of restricting information but of course later and I think it was a meeting with Burns and that sort of thing arguing for openness and reaching out to the Soviets.

Unidentified male: Szilard in the 20's it seemed this idea that the world should be run by these little groups of scientists who would operate in secrecy behind the official government. It found its way eventually into history now the -- where the scientists were behind a bunch of dolphins in a tank. Everyone thought it was the dolphins --

Unidentified male: This whole idea was wise people with Szilard in the group who should run the governments.

Unidentified female: So one of the other tie ins about the secrecy to the social responsibility question is that immediately after the war one of the big questions for scientists was that they felt like they couldn't and didn't want to have to withhold information first for the good of science because they thought that they couldn't actually do their work. But as time went on especially in the 1950's they felt especially constrained, they couldn't communicate with other people freely but they also as people wanted to raise questions about what they should do vis a vis the public, they were heavily restricted even then. [00:45:00] And even if they didn't have formal restrictions they were

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fearful about things they might say, that there were again in popular culture. Supposedly there were secrets everywhere. So you have the American Legion and then other people going after people who were supposedly or could be a risk for giving up so called secrets when there weren't clearly any of them. And so for some of these people it was not only a question of science, it was also a question of democracy and about what you should do as a citizen and for some they can see themselves as a world to this and others thought of themselves as a citizen of the U.S. But secrecy was huge for people in thinking about how to act, what to do and how to make science work better for scientists and for ordinary people.

So I think that would also be a tie in to again there's lots of resources on what their activities were and how they struggled with this kind of stuff. And lots of -- of course there's no materiality that's particularly compelling on it but certainly stories and biographies might be a way to go.

Unidentified male: Alex.

Unidentified male: Two artifacts that come to mind. One is that Groves was one of the first people in the military and government to use polygraphs on a large scale. And it was about making sure that people didn't walk out with lumps of uranium in their pocket or something like that, or people didn't -- I think he was also worried about the silver and they were very concerned about -- they had a huge amount of silver in the treasury and the magnets and he was very concerned getting that back. And I think he did a really good job; if you look up the numbers he had less than 1% -- it's a crazy number of this. He recovered more than he lost.

So that's actually also a way that you could talk about the continuation of national security that means -- the polygraph is before Oakridge. They pioneered in --

Unidentified male: It wasn't so much -- even today it isn't so much that they actually tell you whether somebody lied, but if you hook somebody up to it they'll generally start telling the truth, which is not the same thing. So the FBI -- you can't use the polygraph evidence in court at all. The courts -- we're talking about first scientific evidence things through a polygraph, Frye vs. the Agency and but the FBI still loves him because if you hook a guy up to a polygraph machine he'll confess. And that's all they care about; they don't really care, you know "Oh the needles are going crazy" and then they -- they're done, the guy confessed.

That and the other thing that comes to mind is one of the earliest forms of trying to enforce secrecy very early on with sort of the civilian part of the program first and they continue this [00:48:00] -- oath taking. So this is the very old style and there's these oaths that you had to take and sign, everybody got that said, "I won't give this information away and I understand it's important and if I do I understand I'll be really punished bad" and I've always that this was a very odd -- why is reading a little statement a security -- why does that enhance security at all? But a lot of these security people even today really believe in this, not just because you're signing a contract basically, but also because there is something weirdly psychological about saying something out loud and agreeing to do something.

Unidentified male: Really did that work?

Unidentified male: Well it didn't work for Klaus Fuchs right, I mean you know. But I think it is part of this reinforcing this culture of secrecy, which they call it indoctrination in getting people



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who are not used to thinking in that term to start thinking of themselves as beings within a knowledge control system or something. And I'm just thinking from a museum point of view it would be very easy obviously to put up an oath and say, "Do you feel comfortable saying this out loud"? Because I think a lot of people would be like, "I don't know". Even though I don't believe it and I know there's no actual consequences and things like that, but if they -- it makes you uncomfortable to say stuff like that aloud.

Unidentified male: We could even have people actually have to say an oath to go into the exhibit.

Unidentified male: I think the oath should be that you're going to learn something.

Unidentified male: I will tell all my friends about this.

Unidentified female: So we have a program at the Bradbury that is a school program that explores some of this compartmentalization of the process and groups come together and they have to solve various parts of building a water pump without -- without talking with each other and you can certainly work this into the beginning of that. Now we're working on a very secret project and each group has to take that over and do whatever, and then they also work into this program that they don't actually get water to work with until later on in the process to -- to figure out -- right, so they simulate various aspects of what the scientists were going through. It's a very successful project and it can explore a lot more of these deeper concepts that we were just talking about.

Unidentified male: Somebody had mentioned clashing cultures between the scientists and the military. Presumably there was a shared motivation despite these almost orthogonal cultures --

Unidentified male: But there were big differences. I mean this is what the Szilard problem is, right? Szilard wants us to make a bomb that he A, doesn't want to necessarily use it and B, he doesn't want to become a cog in the machine. And that's the clash of culture. And he actually -- Szilard actually got rid of the secrecy -- internal secrecy departmentalization --

Unidentified male: Oppenheimer argument after all about putting a fence around Los Alamos, yeah. [00:51:00]

Unidentified male: So you still get a clash of cultures even if you're -- have the same goals and the same outlook because you have different arguments about what the best strategy and also who should be in charge of this?

Unidentified male: Sam I think -- you're the other reflector, yes.

Unidentified male: I listened to this discussion and I think it would be fascinating for people in today's culture to realize how successful Groves was and that you had three huge complexes in three different states and labs all over the country, hundreds of thousands people working on the Manhattan Project and most people in the country didn't know any more than Mrs. Groves did. I mean there -- it was a huge secret. It was mostly a successful secret and yet -- and yet today it's impossible to imagine that. So that's one thing that I think might be an interest in an exhibit is that it was different for lots of reasons.

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Unidentified male: Was it different because of the different time or because everyone felt that they had to cooperate to win the war? I mean that's an interesting question to me.

Unidentified male: Yeah, yes. Well you didn't have the media that you have now; I mean when I -- when I talk about Three Mile Island I made a point in 1979 when the accident occurred at Three Mile Island you didn't have CNN, you didn't have internet, you didn't have all these other social media. And that might have been a good thing or it might not, but the fact is it was different. And it was even more different during World War II and partly because the media was not inclined to uncover secrets. But they voluntarily agreed not to -- voluntarily agreed not to.

Unidentified male: Sure, and followed their agreement.

Unidentified male: I think it would be interesting to see today or to realize that you know, there's this huge nationwide project involving tens of thousands of people on industries and laboratories and scientists and ordinary citizens and almost everyone was surprised.

Unidentified male: I guess what I'm arguing is this, if the cooperation was there because the nation came together to win the war that says something rather larger about the war and how people respond to what they perceive to be an existential threat as it's called these days rather than simply - - I mean I don't know that we wouldn't be prepared to do the same thing today. It might be more difficult, that's for sure.

Unidentified male: If there was national unity on the -- on the ends to win a war as it was during World War II yeah, I think --

Unidentified male: Succeeded today --

Unidentified male: Yeah right -- [00:54:00]

Unidentified male: Because he did people inside to --

Unidentified male: And then that's a larger message that could deal with.

Unidentified male: This speaks to what Alex was saying yesterday about the audience and the audience's awareness of what, if you will, technology was like 50, 60, 70, 80 years ago. We've got these kids who've never spent a day without their cell phone and all this other thing and for them to -- I think we need to find a way for these youngsters to really realize the nature of -- not only the national motivation but the nature of the communication systems that were available at the time. So that it is -- it's a historic thing as well as a political thing.

Unidentified male: Not a month goes by in which there's you know, a call for a Manhattan Project to solve this or that and the other thing. Now maybe not a week goes by "Let's cure cancer, let's solve the energy program" and one and one and on. If we did a search I think we would have a long list of things. But --

Unidentified male: But it never happens. You wouldn't know --

Unidentified male: We wouldn't know, exactly right.

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Unidentified male: But there does seem to be something about the Manhattan Project that kind of resonates in the American people that it was something that we pulled up our socks and we got it done and why can't we do it again? And so on and so forth. So we Harkin back to this enterprise here and you know, I never get tired of talking about it and apparently I think the American people never get tired of listening about it or learning about it because it is quite a fascinating story with a great cast of characters and so on.

Unidentified male: The other question I think this whole discussion raises is what is necessary secrecy and what is excessive secrecy? And we all have examples and we all have experienced examples of excessive ridiculous secrecy and yet at some point some things need to be secret. So how do we draw that line and once if -- once you've decided on the line you can do that, how do you implement drawing that line because we all know that this was largely implemented by bureaucrats who have a list of instructions and are generally very cautious in how they implement instructions. So I'm not sure how that fits into an exhibit, but it seems to me it's a basic question about secrecy; what is necessary to protect the country and what is so obsessive that it's ridiculous? [00:57:00]

Unidentified male: How do we convey the idea to the public of a national security state and the - - it's not an exceptional thing for the public because right after the hot war we got into the Cold War, then after that the Cold War ends and we get into the terrorist regime. And basically we've been living with this now for ever since the -- ever since the Second World War. So how do you -- how do you convey this to people this is not necessarily a normal way to be? It's become --

Unidentified male: It's become normalized.

Unidentified male: So let's do Alex, Andrew and --

Alex Wellerstein: Just to push back a little on the Groves was successful thing. I mean there was A, the wholesome union thing and that's kind of a big deal, right? I mean one of the major points and they had everything by the end of the war except for some of the details, but I think it was also the case even with the press -- the information was out there if you knew -- were thinking of looking for it. And Groves knew this and the information technology at the time is actually really crucial to why it doesn't break out bigger because there are leaks, there are radio reports about "Hey we're working on atomic energy", but because the way radio worked back then it wasn't a national thing everywhere. It was a local that didn't get syndicated and Groves could quash the syndication so it would be broadcast one time and anybody who was listening to it maybe would have figured -- heard something. But they never hear anything else about it again and it would only be limited to the area of that nation.

And he had this issue over and over again. It's one of the reasons he made a deal with the people who lived around the secret sites, the reporters around there that if they would agree to be super quiet about stuff he would give them special exclusive stories right after the use of the bomb. So the Richland area newspapers agreed to keep more quiet than they even wanted because then they could write -- they got the scoop on Hanford and ditto with the Oakridge people. So he had to set up all these deals and one of my favorite episodes is a group of Indian scientists from India show up during the World War II to say hi to people. Some of them are rather high level people and the first thing they do is they go to their scientists buddies and they say, "So where are you enriching

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uranium”? And you know, Groves finds out, investigations and they go and they get -- the Indian scientists get really mad because, “You can’t treat us like this, you can’t treat us like we’re suspects. We’re not even citizens of your country and we’re allies”, right? “We’re highly respected scientists” and so they say, “So where did you learn about this” and they say, “It’s obvious to anybody who is reading scientific literature, all the people”; it’s the same things the Soviets say. “If you look for it, if you’re thinking about this it’s obviously you guys must be doing something.” But it’s not obvious that you’ll have a bomb and ready to use; I mean that’s the part that’s the real German -- not that they -- the United States government is kind of interested in atomic energy.

It was well known among Washington [01:00:00] people, circles that there was some big thing called the Manhattan District and it was siphoning out an ungodly amount of money and nobody -- you know and it was probably doing something disturbing or interesting and might win the war. But it’s just one rumor out of a million rumors. After they actually used the bomb the significance and the importance of these things become obvious and things.

Unidentified male: And just push back I think that -- that the idea that it really worked again is a story that grows manufactured literally and William Laurence write up a story called “The Atomic Bomb is the Best Kept Secret of the War” and this becomes the trope of it and it’s not that there isn’t some truth to it. The Germans certainly new that we were interested in atomic energy and that they had, they were not ready when Hiroshima happened. They did not -- they took them -- you know the farm hall stuff is pretty clear that they were -- they were pretty shocked and surprised by it. The Japanese physicists had knew a bunch about atomic energy and they guessed the United States was working on it. They were not expecting Hiroshima and that is -- the difference between the theoretical, if possible you guys are probably interested in it And they actually were going to drop bombs very soon is a big gap. And he was successful in keeping that gap closed.

But it’s nothing like total secrecy; nobody had heard that atomic energy as sometimes gets out there. I like drawing attention to the leaks because it shows how practically difficult this sort of thing is to implement, even when you have control over the technology to a degree -- information technology and things like that.

Unidentified male: Andrew.

Andrew Brown: I just want to say Groves comes at this secrecy was really to secure a national security or a national advantage whereas Niels Bohr is great insight was the fact that the production of nuclear weapons changed the world and what really was going to carry to the future was collective security and that was -- you know he’s a great argument for informing the Russians. And it was a concept which persisted, in fact was accepted by Gorbachev and was very important towards the end of the Cold War and I think that’s a really fundamental change in the meaning of secrecy and security.

Richard Rhodes: You know I was working on my play about the Reykjavik Summit and I tried to trace back to Bohr assuming the idea that Gorbachev was offering collective security. It had come originally from Bohr’s idea of the world—I think it’s pretty clear that it did through the Germans, right and Gorbachev talked to them directly about this whole section and getting rid of nuclear weapons and so it’s a very clear link and an interesting story.

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Unidentified male: Two small items one with regard to the presentation -- I think what -- I think you keep coming back to a lot of this that it was the collective view of national community that said secrecy is [01:03:00] important and this is the way we need to proceed. It's tough in a presentation to -- in a science center environment we have collective enterprise where we want folks to have individual experiences and to come away with personal experiences. So it's sometimes hard to test their personal side and have them not -- without them feeling what the collective environment was for the situation that we're trying to portray. So simply saying we do take an oath and adhere to an oath. It's hard -- it's hard for them to appreciate that unless it's in the collective context in which that oath is being taken. That's going to be a bit of a chance -- it goes back to your ambiguity Allen you know, the difficulty in presenting in that sense.

And so I don't have an answer for it, only I recognize that the challenge in the collective and the individual experience. The other aspect is that we will rightfully come across as having done the right things for the right reasons for the right ends. I think we also have to take into account that others, who would be looking at this may come from other countries, would say I could draw the same conclusion from my own actions. Do I perceive a threat? I'm an Israeli, do I perceive a significant threat which requires me to enter into a mode of secrecy; which requires me to develop in ways that aren't ongoing in the public view.

This is -- how does it look and how does it perceive in another collective context other than that which is distinctly U.S. in its approach? I think somewhere that needs to be included in the balanced portrayal.

Moderator: I mean this picks up more on Alex's point but I think one interesting figure that could be probed to give, you know ordinary Americans a sense of how the media was controlled was William Lawrence whose name has come up several times. There's -- as far as I know there's not a good biography of him, but he was an immigrant, William Lawrence is not his name -- isn't he Russian originally?

Unidentified male: Lithuanian.

Moderator: So I mean --

Unidentified male: His name was Wolf Lieb -- Lou or -- it's a very hard name to pronounce.

Moderator: Right and so he changes his name it becomes he becomes this newspaperman and he is really entrusted with being the publicist for the Manhattan Project. And I think the -- to think in that kind of a -- not just about the suppression of information but the way in which Groves to shape the information that was available is very powerful. And he is really -- an interesting figure for that.

I think too when you're talking about journalists and sort of this collective "We're all out there to win the war"; since Woodward and Bernstein every kid who goes into journalism school wants to be Woodward and Bernstein and I've actually been on panels at journalistic conferences where editors of major newspapers said if I knew about D-Day I'd tell about it—how can you do that? But that's the [01:06:00] attitude now and so I think that's something to think about too is that it truly was a different, different world. And I don't know that we're ever going to see that world again because I don't know that there ever will be collective, "We have to do this together".

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Unidentified male: Yeah there's an incident where Harry Truman when he's a senator, he has a committee and it's investigating waste in the military and everything. He gets wind of something happening out in the state of Washington and farmers are being cheated out of their -- they sold their land but they didn't get enough money for it. So I mean Groves very infrequently ever called on Secretary of War Stimson, Chief Staff George Marshall; very rarely, only when he needed him. But he needed him this time so he calls up Stinson and he says, "You've got a shot at Truman". Stinson calls Truman and says, "The President has a very secret program and we would appreciate it if you didn't look into it any more". He said, "Well it's finished, over". So Truman never pursued it beyond that and never found out about exactly what was going on until he thrust into the President. But anyway I mean -- is it possible today where it's almost inconceivable that that would probably -

Richard Rhodes: What a cynical mind you are. You apparently learn a little bit more. I mean he wrote a constituent who was one of the guys complaining about the land in his letter and God knows what he understood. He wrote, "Oh I found out it was some kind of secret program and it had something to do with uranium" and "What"? Which is exactly what you don't want to tell a senator, right? Because he's going to start -- he's -- it's not a classified letter. He just wrote it to a random constituent and I don't know where he got scuttlebutt in Washington or something. But he obviously didn't understand this --

Moderator: You know what Richard, it does sound cynical but that's exactly what we're going to be up against. We're doing this interpretation is what is the general public going to think when we present this information. And so it's just something we have to come to grips with and figure out how to do because that's going to be --

Unidentified male: My concern is if it is indeed true that that was a different time, that's a very significant and interesting fact or was it a different time because of the war effort and the feeling that we had to pull together. If so then perhaps it's not so different from today; I mean of course 9/11 and everybody scurrying about and so on, all of us willing to take off our shoes and our belts and so forth to get on planes. There are some parallels today that have to do with the same kind of thing; that we're all in this together. So you can contrast it and leave people cynical if you will, about we would be like that now.

Or you can find ways to say, maybe we would; [01:09:00] and if not at least look at why they were -

Unidentified female: What would it take for us to get to that point today to do that?

Unidentified male: Every block in my childhood there was a -- one of those little felt flags with a gold star in the window which meant someone in the family had died during the war. I remember vividly even as a little boy we felt a sense of it was really important to take all that aluminum foil from cigarette packs, anything you could find you were helping the war effort. So really in that sense it was very different but I don't know if we --

Unidentified male: I think it's interesting that you brought up 9/11 because I didn't start working at the museum until 2004 and kind of, you know I'll be the first to admit that I didn't know a lot about the Manhattan Project going into it. And after sitting at this table for the last you know, day or

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so, there's still a lot to learn. But I -- I feel like after I've had time to reflect I feel like post 9/11 at least in those -- those days that followed we got a taste of that.

Unidentified male: I agree.

Unidentified male: And you know it didn't take long for the conspiracy theories to come and it kind of died down. But I -- you know I would say we got a glimpse of that patriotism that spread across the country.

Unidentified male: But it died down because we thought the threat was --

Unidentified male: Because the threat -- right.

Unidentified male: It was continuous during the war. The irony in that is that in some ways it was the press that brought out some of that patriotism. I mean because the press let you know in no uncertain terms what the conditions were, what the actions were in all parts of the country at the same time. Now there were certain biases with certain aspects put into it, but you know, if I were at the museum or if I were representing the state in that fashion I would take the approach that says our openness and our distribution of information is actually what fostered that.

Unidentified male: That's true and a lot of it deliberately.

Unidentified female: I guess, I think I understand your point about the idea of the spread of patriotism but it's also the case that back in the Second World War September 11 also brought on massive xenophobia and there were other much uglier parts of that. And I say this living in New York City after those first two weeks were harrowing for me in part because people were all over the place with guns and there was enormous amount of hate talk against other people and conspiracy theories right and left. And people that surprised me who said, "Oh if you -- if you're for civil liberties then you're for Osama Bin Laden". There was faculty at Columbia University telling me this. So my point is that I want to make sure that we're not [01:12:00] all -- we're not just saying that these are the glory days of patriotism but that it is more complicated.

And I'm also mindful that we -- that if this thing is going to get off the ground you don't want the "We hate America", but two at least keep in mind there is complexity then and afterward that I think would be irresponsible not to represent in the same way that the questions of secrecy today what should we do, what shouldn't we do come from many Americans with extremely mixed feelings. I mean they're great about thinking somebody else should be under surveillance, not them right? And then they're -- because everybody thinks this, right? It's great to spy on someone else, just don't tap my phone. So I -- at least in thinking about what the parallels are now, to think about how those -- we don't a centering event right now in the current moment that's going to make everybody feel like we should be patriot and we should all think the highest rates of secrecy apply. But I just want to make sure that this thing is not just that we're all for the team and it was all great.

Unidentified male: There was a parallel with McCarthy --

Unidentified male: Part of the reason we are so cynical today is because of stuff like this. I mean because we found out our government does do crazy science fiction programs behind closed doors and then drop them on cities and then all the stuff that came as a result of the secrecy and the

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McCarthyism and all -- is not unrelated. So there's a historical evolution to be told why are we so cynical today? It's not directly because -- I mean some of the stuff is Watergate, which is nothing nuclear. I mean that's --

Unidentified female: Science experiments, I mean when people find out about Tuskegee or they find out Willow Brook, other kinds of things. I mean they find out people are doing things that; you know they didn't know about and people said they were okay. And people are hurt by it, so I do think people are -- they are less confident in most social institutions, they're more cynical. But at least historicizing this as something back then this was really unusual. This was a different kind of thing; this was a new thing for people. And then using that also as a springboard for what you guys are all laying out so nicely, which is what happens after that and how does it evolve?

Unidentified male: You know you only need a poster from World War II of the Nazi and the Japanese to realize how much hatred -- they were elsewhere so you weren't -- they didn't have the same sense that the enemy was within.

Unidentified male: We interned the Japanese—

Unidentified male: Yeah right.

Unidentified male: They were the enemy within I think; we had posters like that that you could use in the exhibition is not too inflammatory. I think they should be there.

Unidentified female: It's just posters; I'll never forget one time I ran across a Time Magazine and it talked about how you could tell the difference between Chinese and Japanese and how Japanese were sneaky and little, you know and Chinese were big and strong. [01:15:00]

Unidentified male: I once had a teacher tell me that the reason why microelectronics were -- this goes to show you how old I am, were invented -- so much was invented in Japan because they had smaller fingers and more attention to detail and they had -- so he's right, right?

Unidentified male: Alexandra you are waiting to say something for a while.

Alexandra Levy: Oh I was just going to say, maybe one idea would be to have profiles on some of these people we've been talking about like William Laurence, and Winston Churchill deciding not to reveal that Coventry was going to be bombed and discussing their decision and why they made that and you know, maybe ask people "What'd you do today" and "What do you think about this decision"?

Unidentified male: I would suggest that the strategy for the -- we can choose for the exhibition obviously we see this as a continuing story right up to today. And I think raising the issue of "Would we accept today the security stay that we accepted back then"? That's certainly going to raise concerns and complaints. What's your strategy for doing this to minimize potential conflict is to say this is a historical exhibit and so we're going to have a hard stop. This is going to end in 1952 or whatever date we choose. And then you cheat just a little by having an epilogue, the section that says, "Here's some thoughts on how the impact of this remaining today" or the contrast today. But you make it an epilogue. You make it specifically say, "The bulk of our effort and interest and goal



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in this exhibit is to tell you this story of the Manhattan Project”. In the epilogue you can begin to raise some of these examples and issues that “Would we have done it today”?

One that comes to my mind which is I think not terribly well known but these people know it, is the crippling of the GPS system.

Unidentified male: Yeah.

Unidentified male: If you have a GPS; in general this has changed the last two years. But in general that unit is capable of locating you within a foot, but it can't. It is deliberately crippled so only locate you within about 10 yards and that was because the military felt that the extreme accuracy that the system is capable of could be used by anybody to target their own missiles. So they deliberately randomized the last four digits I think of the time code and its encrypted [01:18:00] so the military could decrypt it and get the super precise GPS and your little phone or GPS unit was prevented from getting those last digits. They decided two years ago that this was no longer really necessary, that the -- that anybody could use this information accurately enough to target their missiles; however most GPS units have not been upgraded. You have to buy a newer one or get new firmware for your GPS to have the same accuracy that is now publically available.

But the fact that we -- by the tens of millions we accepted this restriction and the companies that made the equipment accepted not trying to decrypt or encode, that's an example that we still are willing to compromise our complete freedom of information and everything else. Even if it's somewhat to our disadvantage. I've turned on the wrong street because my system said, “Turn right now” and I could just make the turn now but I was actually supposed to go another 10 or 20 yards down the road and then turn.

Unidentified male: But just a fine point on that which is in today's world one of the challenges of that particular decision was that in the global environment which we exist right now one element that we had to go into intense debate was working with Europeans on how they were going to approach the same technology. And they didn't see it the same way that we did for quite a long time and so you know, again we don't operate on -- we didn't operate on in many ways with regard to the Manhattan Project. We definitely don't in today's world want to come to these kinds of technology; we would really want to reflect how that works on a global scale.

Unidentified male: Anyone else?

Cindy Kelly: I thought it was an excellent discussion; good job class. That's very helpful.

Cindy Kelly: The meeting is called to order; we're talking about the Cold War and how we avoided Armageddon. Listen up. We're really delighted to have John Ferguson back; it's a lead on this and to start us off and a great team.

### **[Presentation: The Cold War: Avoiding Armageddon by Charles Ferguson and Bud Rock](#)**

Charles Ferguson: Great, well Cindy -- wow you're in high spirits, I love that. You're always in high spirits, it's terrific. I was just telling Bob it has been a pleasure working with him through e-mail and back and forth with the paper and maybe we're kind of over achievers. The longest papers and people get mad reading it, but no I'm really pleased to work with Bud and I got to give him a

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lot of credit. He probably wrote about two-thirds to three-quarters of it. And so I -- you know I chimed in on anything kind of nuclear Cold War related. And as I mentioned briefly yesterday I kind of gotten into this field back I guess 30 some years ago. And so I'm just thrilled to be able to speak here today on behalf of the Federation of American Scientists, the longest organization working on nuclear arms control issues in the United States, maybe in the world as far as I know; only rivaled by the Pug Wash organization. And so this is an issue that is still very much current. So thinking about conveying this to the public, the role of scientists during the Cold War whether it's in competition or cooperation, these are themes that are still with us to this very day. Those of you who read the Washington Post saw there's an op-ed Steven F. Cohen talking about avoiding the next Cold War. The New Cold War tensions are very high between U.S. and Russia not anywhere near it was in the Cold War, but still there are very -- the issues that we grapple with during the Cold War and that Bud and I allude to in our paper are still very much with us today.

In particular issues of missile defense. I mean that's still very much a bone of contention between Russia and the United States and that was an issue. And I've realized actually re-reading this on the way in that I don't think we actually mention missile defense early in this paper, well we should have. That was an area where I think back to people I deeply admire like Frank von Hippel or Andre Sakharov; the collaboration that U.S. and Soviet side especially during the 1980's was really key in terms of influencing the thinking, especially on the Soviet side. Mikhail Gorbachev on the U.S. side [01:38:55]; President Reagan were more influenced by those Lawrence Livermore that side of thinking in terms of the U.S. scientists. That's by way of saying they're not monolithic views obviously. And so when we're conveying these issues to the public we don't want to give the impression that the scientific engineering technical communities are any kind of lock step agreement as to what needed to be done. As in good science or good engineering you have to test ideas. You have to ask the right questions. You have to be very critical of yourselves and others and especially the theories you construct about what is a good defense? What is a defense that's not to undermine your enemies so much as to lead to spiraling arms race?

So this is one of the key issues that really -- the scientists and technical people wrestled with during the Cold War is how to prevent the arms race from spiraling out of control? And they had successes and failures. I mentioned the Pug Wash movement is paper was huge, you know -- Andrea Brown knows that very well and very great biography of Joe Rotblat that recently came out. So that was an example of a movement that sprang forth from the Manhattan Project. So Joe Rotblat was really the only scientist who quit through matters of conscience before the bombs were actually detonated on Hiroshima and Nagasaki. So that is a legacy of the Manhattan Project that's worth educating people about.

Why weren't other scientists so moved to quit before the bombs were used? Yesterday we had a very vigorous debate and discussion about the decision to use the bomb and Stan Norris I think ably argued that really it wasn't so much a decision on the U.S. side and then I chimed in later saying you know, after we had this debate between Peter and I think it was Sam Walker and to the extent it's really that -- to my mind relative to the decision and debate was more on the Japanese side so I think we need to convey that as well.

In terms of the -- getting back to the issue that our paper -- what can be said in terms of educating people, there's so many things. There's so many cooperative activities that took place going back to the time of Atom's for Peace and there was pluses and minuses for Atoms for Peace, which I mentioned very briefly in this paper. So on the plus side we had this flourishing of scientists finding

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creative ways to deploy nuclear medicine and nuclear technologies to agriculture. And obviously electricity generation and [01:41:55] you know there are those who may say “Well those aren’t all glittering benefits. There’s some downsides to that as well. But I think on balance my view would have said, “These were benefits to humanity”.

But on the negative side of Atom’s for Peace we saw a proliferation of plutonium technologies going around the world; that’s something we’re still dealing with today. It’s still a huge problem. We saw a proliferation of weapons -- usable weapons grade uranium around the world to client’s states. Both clients’ states, the Soviet Union and United States so we saw dozens of countries with dozens of research reactors using this type of material which is weapon usable and terrorists got their hands on it and fashion it and provide nuclear device. And we mentioned in the paper that this eventually led to cooperation between the Soviet Union and the United States. The experts came together in the late 1970’s and they’re still continuing that work today on trying to find ways to minimize and hopefully eventually phase out the use of highly rich uranium in these types of activities.

So this once again another example of how work being -- that start during the Cold War is still very relevant today. And I could -- I could go on and site many, many examples but if you had time to read the paper I don’t need to reiterate those. Let me segue over to the bug because she wants to talk more about the non-nuclear scientific cooperation side of issues during that time period.

Bud Rock: Thanks Charles for that. And this is intentionally just a position here because I think it’s just important that we bring out this other aspect of science during this Cold War period. And here I’m sort of in a different mindset; I’m not in my science center mindset right now and my former state department where I spent 30 years.

So but I think it’s just really, really important to say that even as we are in what was clearly a Cold War period by every definition we did have scientists communicating with one another, struggling but communicating with one another between the United States and the Soviet Union proactively. We had -- in the physics domain broadly we had cooperation and interactions going on in the mid 1950’s between researchers. In 1959 we had agreements signed between our academies that were challenging to execute but they were active nonetheless between that period they resigned several times their academy agreements. But in that period of time we had [01:44:55] almost 25 cooperative exchanges between academies on a whole range of issues. And of course one of the most well-known was the work that was done oral polio vaccine work during that time period as well.

So this idea of scientific cooperation and the thrust we should talk about a little bit earlier this morning, there was attention and desire for this scientist to find mechanisms to retain those linkages because of the value that they saw in science and it’s light. When we entered into the formal government to government collaboration in 1972 I can tell you that the establishment of a joint commission to oversee that process like so many of our bilateral agreements was more of a constraint than it was an opening. It was very challenging for us to even identify what the original six priorities were going to be under that cooperative agreement. Nonetheless we did focus on energy R & D, we focused on water resources, we focused on computers. It was an early -- early look at computer relationships and then we focused on core areas like agricultural research and what they, at that time were calling microbiological research, which was an early aspect to some of the health cooperation.

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What was interesting was that the joint commission at that time was trying to find domains that would keep the enterprise of science open without pushing too far into areas that might be perceived as competitive in the national security sense or otherwise. And they had a terrible time defining what that was and in fact, the Soviets had a more difficult time than the Americans did in some ways so that when we -- when we approached peaceful space activities for example, the Soviet Union had a very hard time lending itself to the multi-lateral discussions that were going on space related issues and really had to be encouraged to come to the table and be part of that discussion. But you know, I don't want to overstate this. There was a dramatic reduction in the -- in the trust and the respect between -- between the science communities during that period of time, but there was a desire nonetheless to keep those -- those channels open. We -- at the state department we always used the Soviet example as the -- the line that you hear over and over and over again is in the coldest periods of the Cold War U.S. and Soviet science always maintained their relationship. Well yeah, that's true we did and we had agricultural researchers going back and forth, or we had health researchers going back and forth.

This isn't to say that we were opening up our core and our broadest enterprises in science. But we understood [01:47:55] what science met in the relationship between our -- between our countries so it became a cornerstone of foreign policy. And quite frankly when the bureau that I was responsible for in the state department was actually founded in 1974 as a separate act of Congress within the state department. The bureau that handles science and technology and it was done in part because of the recognition that science and technology is a linkage to cooperation and it can be done in a context of broader foreign policy objectives. And it was the U.S., Soviet collaboration during that time period that helped to -- helped us reach a conclusion that we needed that function within the department over all.

So I wanted to be sure that I -- that I phrased that aspect of the science relationship. My actual task here is to say a few words about presentations so now I'm back in my science center hat.

At the -- I have to pause to do a quick anecdote beyond the subject of secrecy and what we were discussing this morning; I just have to say this. My father is 94 years old. He is a D-Day survivor. He landed on the first day and he was the -- had the first cryptic -- he had the first cryptographic unit that hit the beach. He stayed in Europe and he also decoded the message that the war had ended in Europe. Now my dad still has that decoded message; it's on the wall in his assisted living home up in Baltimore. When I retired from the State Department and had been in the State Department Intel community I was invited to help work on the cryptologic museum at the NSA. So I went to my dad and I said, "Dad I'd like to take that decoded message and put it in the museum" and he said, "Nope." And I said, "Look you know, I mean no one is seeing it but you and the public should see this; it's an important artifact" and he said, "Nope." And I said, "You know what's the difference, you know, it's an important piece of paper and people should know about that". He said, "When I die you can take that and you can put it in the museum." I said, "Really, why"? And he said, "Because it's classified." People know -- that's where the mindset was and still is when you're in your -- when you're in your 90's. I've got it and I shouldn't have it. So one of these days it will be declassified and find its way into the museum environment.

So I just -- I just wanted to -- I know this is almost impossible to read and that's for my sake, not for yours. Yesterday after we -- after we talked a little bit I went back and I just did the quick Wikipedia and said, "How many atomic museums are there out there"? [01:50:55] And I know you can't read this but it's an extraordinary number of museums that are dealing with atomic related

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issues from a research and production to delivery vehicles and a variety. And a lot of these are site specific and I realize that we -- we talked a lot yesterday about the importance of sites as representing the issues more broadly. But it's pretty astounding the number and each one has its own particular component of the -- of the atomic enterprise and it's almost all historical.

So just to review something that I said yesterday, the -- science centers today and the informal science enterprise really is a collaboration of all the interests within the community so when we speak about what a science center, museum or an exhibition should do we have to assume that we will be drawing on information that will be coming from the libraries and the research laboratories and the think tanks and corporations and universities that are all within this domain of informal science learning. And that the science center will indeed be drawing on that. And in turn that the science center will be distributing this information through a variety of different means that it's not just do we get the exhibit right, there's nothing wrong with having a form -- a set of presentations that is an exhibit in one form, that is a -- that is a community dialogue in another form, that is a theater in another form. There's nothing wrong with doing a collection of these kinds of activities and it happens all the time in the science center setting.

So there are few considerations that to me have come out and they've already been addressed just a little bit in our -- in our discussions this morning. I think it's healthy that we're starting to see some overlap in the discussions that we're having here. The first is what I call the public challenge; I'm not sure that this message is about a commitment -- our commitment to democratic action versus reliance on expertise. In other words I'm not sure we're trusting the scientists to act as scientists on our behalf. In our society how much of it -- how much of this needs to be about whether we made a collective decision or whether a collective decision was made for us. And that -- that goes to principles that extend into -- more into social dynamic than they do into science. A lot of you ask the scientist, they of course will say you obviously want to rely on the expertise. But within that context you know this -- you can take this same message in the nuclear domain and extend it out to genetically modified organisms or some other aspect where we're dealing with the -- the communities willingness and right to be part of the decision and the reliance on expertise.

The second point consideration here is science and historical context. Whether you are talking about total may or the [01:53:55] Manhattan Project or the cyber universe today, science while we call it objective is always going to be a historical context. You're going to see it with regard to the environment in which you have to employ it. And so for that reason we have to decide how much of what we are about to discuss or present on the Manhattan Project is intentionally in historical context? In which case you can say, "This is what they thought at the time, this is how they acted at the time". That's how we do history and science exhibitions or presentations. We assume however, that you're going to -- as Alan said you're going to have an epilogue in this where you're going to move it forward and say that was right, that was wrong or there's something else we should derive from it.

If we're doing it as a history -- as a historical approach context becomes really important. The other thing and we allude to this a little bit yesterday, was incorporating generational considerations. I'm truly taken by Alex the other day, from your wife, that people would say, "Well why were they worried about it"? I mean this is -- that's not trivial, I mean the fact that we will have generational considerations in what we look at is really important. At one extreme you have biases; you have the Enola Gay-style bias. But you have the bias -- the bias of not fully informed and not feeling the need to be fully informed about context for younger generations. And that's why I put the fourth

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bullet in there accepting that there are varying degrees of public understanding and engagement. In some cases there's not really a willingness to grasp this entire aspect other than "Wow cool history". And so we have to recognize that as we go in.

Now with regard to the presentation itself I stole this entirely from Alan yesterday. It is -- there's no question that the complexity of the message, the ambiguity of the message and the multi-thematic approach to the message is what is challenging us throughout when we think about how to -- how to deliver this most effectively. I just -- I put in two sets of pictures here just to make a point. These happen to draw from the National Museum of nuclear science and history; you did hear me say history today here, right? And I -- you know I just wanted to make a point here if what you want to show is nuclear science and historical context ends and how good intentions can also bring out fears and dangers, you -- you have -- pioneers of the atom and you have historical presentation and then you have a radiation 101 again, I apologize you can't really see this that far away. But you have a room that kind of describes radiation 101 [01:55:55] and then you have a typical bomb shelter. You have the 60's experience. You have images of the Soviet Union. You have delivery devices and what you derived from this was well intentioned people take us to a dangerous and challenging age and that's what you feel as you -- as you go, for which we really needed to prepare.

And you know, simulated bomb shelters are the -- are the best examples of that. Everyday life in an extraordinary circumstance, the bomb shelter. Alternatively of course you can -- at the same time use that same era, that same Cold War era and you can talk about U.S., Soviet polar exploration. You can talk about shared meteorological studies. You can talk about polio vaccine work, you can talk about satellite collaboration and ultimately of course you can talk about -- about shared experiences in space.

I think it's important that -- important to get to the generational aspects of this that we not have -- have someone go through a presentation that gives them this without giving them that because I think it is important holistically to what -- to what we as individuals are trying to demonstrate in science.

We talked about this a little bit yesterday, the way that we get at this is that whatever -- whatever we present has got to be a collection of activities and debate and discussion is a really, really important component of this. And somehow or another we have to ensure that this is not a static presentation.

So some ways that we might look at what I would call active engagement is that our exhibits and our events need to be specifically designed to incorporate a variety of public perspectives into the presentations themselves. You -- it's okay if [01:58:55] people come through and say, "Gee there were a lot of different views on the subject. That's actually informative in its own right that there were differing, differing perspectives. The other aspect of this is that we need ways to encourage direct interactions by individuals and groups in the presentations and I think we started to allude to this this morning. The idea that you would have combined gaining exercises I think is a good example of this to show compartmentalization or something of that sort. I think it's important that you have -- that those -- that those dialogues that we have extend beyond the experience itself that you have take-home exercises so to speak. That you continue the discussions outside the actual exhibit environment as well. We talked this morning also already about roll playing, theatrical performances and -- as some of our compartmentalization exercises were more like the table top gaming that we've done.

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I think it's also important that at some point throughout the exercise, whether at the beginning or at the end of the exhibition you have some kind of real time group surveying. It's one of the things that I find lacking in some of our more profound exhibits. We do it a little bit with the -- with the race exhibit. I don't think we do it enough with sensitive exhibits like body worlds. You actually do want to capture people right when they're having that experience and ask them, "What do you think? What are you feeling about this? Give me your first reactions", those things are really important. The other thing is that when you have gone to the trouble developing the exhibit and creating this environment, use that opportunity to hold conferences or commemorate special days at the exhibit or in the location of that center. If you have a day that's being marked in history and you want to have a dialogue around it, do it with the back drop of the exhibition and invite more discussion in that regard.

In today's world virtual programming you know, obviously extending the experience again beyond the actual activities in the science center or in that environment into online gaming and online activities, this is absolutely right for this because of the varying perspectives that we might have. And then I throw in at the end that the importance of museum and library programming. I think it's really important in this case that we have so much information, so much data, so much archived information that -- that you need to draw that information into the presentation and you need to make it -- make it aware for people that want to extend the experience and go much more deeply into the subject. It's the equivalent of putting your link at the bottom of every paper you do or every web site, you know, extra links go to. It's that kind of a activity [02:01:55] there just so much information that we really need to do.

I threw this in again; at the end only to make a point that outside of the United States I happen to use the science center in Tokyo, Miraikan, they took a very different approach in my opinion to how they communicate the importance of science. What they attempted to do was to say the -- this is using my words, not theirs. That the burden, the onus if you will on communicating the value of science is actually on the scientist. That what you really need to do is focus much more heavily on what the scientist was trying to convey to the public. What the scientist can convey to the public and how that -- how that gets done. So instead of saying, "What do I as an outsider need to know and what should I be aware of, what was going on in the science community? If you turn that around in the other direction and say, "What did the scientists know" and "How would they or could they have conveyed this information in ways that the public would be able to grasp and absorb"? That's an interesting challenge because many -- these, as we all know very well here -- these are scientists dealing with very complex issues who knew how to speak to one another. But would have had, in many cases a great deal of difficulty communicating this in the right way to the -- to the naïve observer, if you will.

And that will be one of the most challenging aspects of this exhibit. If we don't truly understand what they were talking about and we have to be made to understand it in lay terms if you will, imagine how they would have tried to convey that to us in the same way. It frankly is the heart of what Frank Oppenheimer was trying to develop in Exploratorium, that there were -- that it's on the scientists to make science relevance and ultimately in the public interest. I think that's the last one for me there.

Unidentified male: Yeah actually this morning at NPR they had a story about scientists now using Kickstarter to get funding for their project. So they're creating videos, even just relatively

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simple You Tube videos to try to explain their science to the public so they can get investors for their research. And some are pretty good at doing it and others are not so good.

Unidentified male: It's interesting you say that because one of the places that I've been looking at lately for additional resources for the work that we do is to the national venture capitalist association, the venture capital community because if you talk to venture capitalist you will say -- what I want to back is the kind of science enterprise that is over the horizon, that is [02:04:55] the next stage and that's where -- that's where the real emphasis is going to be and that's where the return is going to be, which is true. Unless you get so far out of the -- ahead of the public that the public says, "I don't get it"; now that sounds like science fiction, I don't get it. So educating the public to keep in step with science progress is a challenge.

Unidentified female: I heard that same broadcast and what I liked about it was that in making those donations they get a lot of e-mail responses about what it is your working on and so it's a nice tie into figuring out where your audience is and where their interests are and what their expectations for that kind of project would be.

Unidentified male: Yes and remember the public might have an interesting idea the scientist can then use for her work.

Unidentified female: Exactly.

Unidentified male: Absolutely.

Unidentified female: So I really like the idea of thinking about how scientists could have conveyed information and taking their point of view. I want to say again that the -- this captures the responsibility of scientists. Many scientists try to figure out how would you convey such and such a thing to the public. For example conflict CNI endlessly, but through other organizations as well who try to in the post war period and particularly after 1960, who try to explain to public's risks, dangers, possibilities for a variety of different kinds of scientific issues and problems.

Some of them became more formalized, there was a proliferation of them in 1969 NRDC was founded then, there was just a bunch of them. But in all of these cases they had particular conceptions of public and they had particular conceptions of what they could know and understand and they had specific conceptions of scientists. Was the scientist job to publically share information or was it not to do that? Was it only when they were asked to provide information? Concerned scientists is another good example of that, people who started to respond to questions by public and had to make a bunch of decisions about how to present this critical question of uncertainty and how to handle those things. All those things come out of this question from the Manhattan Project about what to say to publics, how to handle things with publics and there are many different organizations and scientific actors including paraphernalia of all kinds that are available to show people how scientists at those times would have been trying to convey things.

And again, one of the things that you talked about earlier was about cold wash and about the scientists to scientists -- the what do you call -- what kind of diplomacy? Mike what's the name of the -- it's not government to government; it's scientist to --

Unidentified male: Or something I'd even call track two --



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Unidentified female: That's the word I'm looking for, track two and about what they could say to each other and how they could convey things to each other. And thinking themselves as [02:07:55] a kind of a separate world of communication that could then also inform the -- informed government. And I think it's because I think it is interesting to people today to figure out what -- I mean how to know about things in the world that are going on, who to trust, how to think about knowledge of various kinds, about really pressing political issues.

Unidentified male: But you know it's interesting because there's some -- I love the statistics that have come out of the National Science Foundation and others about communities trust in their scientists and the trust is actually very high. While at the same time the knowledge and understanding of the science is quite low. I think one of the biggest difficulties we have here is in the nature of the scientists themselves. I mean the quest to learn means that you operate in an environment of uncertainty and so you -- you thrive in the environment of uncertainty because your job is never done. And so you can continue to move in that regard. I think -- for the scientist to become the policy maker or to be involved in the policy that they're challenged on two parts. One, they're being asked to reach certainty and they resist it and secondarily they know that the questions that they're being asked frequently are not based in science to begin with. The questions on genetically modified organisms for example were socioeconomic questions; they were not fundamentally science questions. When the Europeans raised them they raised them for socioeconomic reasons as much as science reasons. And with that backdrop it makes it hard for the scientists to say -- to respond in an environment that they're less familiar with.

Unidentified female: Yeah I guess I want to just say one thing about that. You know I'm a sociologist; I'm not a historian so I come with a critiquing perspective. And so one of the things that we do know is that when you take surveys and ask people if they know how many planets there are or any other thing people get all kinds of things wrong. But they tend to get things -- get much more motivated when things affect them. So people begin to know about what's the ecology of Lake Michigan when they can't fish in it anymore. And they start to find out more about what can radioisotopes actually trace or not trace when they become sick. So more and more motivation through these individual level questions particularly around things like health, environment, those are very compelling to many people. And I think there's also a variety of scientists who engage in these things in different ways; so people think I'm just going to tell you what the scientists have now been asked to do with it. Other people work in collaborative citizen/scientist projects where they say, "We actually need your input to count birds" or whatever else they want.

So I think there's -- there's lots of possibility for also looking at things like citizen/scientist collaborations and about diverse ways in which scientists do engage people from just saying just the facts to "Let's try [02:10:55] to solve problem X together". There's a wonderful example of guy in Albany who has been working for 20 years with the Mohawk nation on PCB's. And he has been -- he said he couldn't do the research without their cooperation. They needed him based on kind of an interesting thing going on where normally scientists are told you have to go learn their culture otherwise you can't work with them. Well he told them, "You have to learn my culture; so you have to come look at what I do all day and how I review papers, what I have to do. I can't just write things that suit you only". So we truly have to know each other's cultures and he has had a very fruitful, very productive career that does good science and also helps to answer questions that they have about particularly intergenerational transmission of problems from the PCB toxicity in the Hudson and other areas.

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So I'm just encouraging a way of thinking about it as the trajectory unfolds and broadens for a variety of different ways scientists might interact and being respectful that scientists have really different ideas. I mean some of them say the minute you take me out of the lab, no thanks. Other people say, I really need to engage people in these ways. So I'm hopeful that we can have something that's like that and there's lots of kind of cool -- you mentioned citizen science a bunch of times and I'm just hopeful that we can have some of those things included in the exhibit.

Unidentified male: Yeah, very much so.

Unidentified female: I think another modality to be explored for sure is the Chautauqua performance where you get such an excellent look back at some historic figure. And they are embedded in that character and they can really bring home to you what it was like for that person to be working, at that time, under those circumstances. And what they thought we saw and brought Susan Franjak is her name who does an incredible Madam Curie, just fabulous. And of course she's so totally in the time and in the character; so I think some of these things that you're talking about could be brought out fabulously. So there's another fun thing, play write Chautauqua --

Heather McClenahan: I want to speak a little bit on this topic and ask some opinions on the group here of this generational considerations when you're talking about the Cold War. We've talked about the complexity of the Manhattan Project and how you have military and scientific and economic and political. So it's very complex to talk about the Manhattan Project. The Cold War is beyond that in complexity. And we've got these young people in the room here who did not grow up having any -- I mean I think Ken and I are probably the end of the generation who had a little bit of the fear of atomic warfare. I have a 13 year old who [02:13:55] is doing a science project -- or a history project right now on the Russian atomic bomb, the Cold War. She has no clue. She doesn't even know where to start looking for resources and she's grown up in Los Alamos.

So how do you teach kids who have no concept of this horrible fear of these horrible weapons what the Cold War was?

Unidentified male: What do you -- what is it that you want to teach them? You know because I think -- you know I didn't grow up in George Washington or Thomas Jefferson's era either but you know, I get the concept of you know, that -- the founding fathers because we have the Mt. Vernon's and the Williamsburg's. And this goes to sort of the theatrical aspect of this, we can do it, but we have to ask ourselves "What is it that we want to convey"? Going back to my point do I really want them to understand bomb shelters and what -- why we were -- at some level I want them to understand why we're saving Campbell's Soup cans and that; I do want them to understand that. But that's not -- that's a bias of our experience and I'm not sure that that's all of what I want them to grasp from --

When we say "Cold War" my era, we say fear. Cold War -- Fear. And there was so much more complexity to it than that and so I think we have to determine which of these -- which elements of this we want to be the most important.

Unidentified male: That ties in; I mean fear is the motivation for the non-fear stuff, right?

Unidentified male: Yeah.

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Unidentified male: The more they talk about -- the more they say the word "Peace" it's an indication that they're really thinking about war, right?

Unidentified male: That's a very, very good point you know you wouldn't have peace in many ways; I mean you didn't have -- the whole UN enterprise to form you know, around atomic energy to form a collective multitude enterprise around atomic energy was out of fear. And by the way it failed initially in its efforts, but you're absolutely right we have to show that balance some way.

Unidentified male: It's more than just fear when we're dealing with some of these things; it's also aggression. When you talk about atoms for peace and you trace it back to the --

Unidentified male: Yeah --

Unidentified male: And I don't see it that way at all. Eisenhower's motivation of pushing atoms for peace was largely to make nuclear weapons more socially acceptable and is very exclusive about that throughout this period. And it was denounced by Henry Smyth who was the only nuclear physicist on the atomic energy commission at the time as a thoroughly dishonest proposal. He understood the proliferation risks, the Soviet scientist immediately came out and denounced atoms for peace in terms of the proliferation and then the kind of projects that it evolved [02:16:55] from that whether it was project chariot using hydrogen bombs to build harbors. There was one plan to actually melt the polar ice caps with it, with the hydrogen bomb. Another wanted to redirect hurricanes by detonating a 20 megaton hydrogen bomb to change the direction of hurricanes. And in terms of the international proliferation the first place where they wanted to build -- they proposed to build the first reactor was in Hiroshima, which sounds crazy but this was part of this whole strategy for proliferating. And the enrichment in some of these reacted overseas got up to 93% and we had sold them, we were supposed to deliver the enriched fuel to Iran right before the revolution of '79. So there is a very complex history but it's part of Eisenhower's strategy to make nuclear weapons conventional.

I mean he wanted to erase a line between conventional weapons and nuclear weapons and in order to do that he proposes atoms for peace program so again there is another side to this, not the idea that it's all good guys, well meaning, well-intentioned trying to create peace. As Alex was saying you know, there's another side to when they say peace, think war very often.

Unidentified male: Yeah and you know unfortunately in that same context what that report also did was it made much of the other science that was being done at that time subterfuge; people said it's just another type of science. Because after all we're doing meteorological work and we're doing health work and we're doing agricultural work. It's just another kind of science, which didn't convey the significant of the transformative nature of what was happening in that science domain versus a new agricultural development or something. Alan?

Unidentified male: Yeah I want to stake out a position for after lunch here. The last attempt to build an encyclopedic science museum is the one in Paris in 1983. And it was abandoned the year before they opened. We're talking about one exhibit. I am absolutely convinced from what you guys have been saying the discussion we have that the second exhibit in this series ought to be the Cold War Museum.

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Unidentified male: Well there is, I mean there is an attempt at Cold War museum already here --

Unidentified male: Yeah exactly.

Unidentified male: For the Manhattan Project exhibit I'd say the discretion would be the better part of valor here and we should say that the Cold War goes into the epilogue, but we're going to cut the exhibit off at some point in the early 50's, or even the late 40's because otherwise remember the -- we're talking about an audience most of whom don't remember the Cold War [02:19:55] let alone -- they probably know more about World War II than they know about the Cold War because there have been more movies, television programs about World War II. But just for consideration for this afternoon you don't want to limit yourself too early, but I don't think this is too early. By the time we leave at 4:00 tonight it's going to be too late. So I think by then we should have decided on the boundaries of the scope of the exhibit. And I was not joking when I talked about the Cold War museum.

Yes there are the museum has a whole Cold War section. I'm sure there are lots of Cold War exhibitions but what sites would you preserve for Cold War museum? Let's get our bids in early to save these sites before we discover we're behind the eight ball and someone is tearing you down.

Unidentified male: This I -- I think we should take on board Alan's suggestion. I think we should think about it also in the sense that are we developing a history exhibit in which case it is time constrained and we have to put all the context in it. Or are we trying to derive a message from the Manhattan Project that we think is relevant today in which case -- which case -- what way is it relevant? How is it relevant? And I think those are two different types of presentations.

Unidentified male: I agree but my point is that the power of exhibits and other forms of communication is you don't always have to make your message explicit right to the last detail. Sometimes it's more powerful to tell a story and let the audience figure out how to pause today and I think that's why the continuing popularity of Avatar, the movie is basically a cowboy's and Indian's story set in the future. But very few people saw that and did not realize the political message that the producer, director, writer was trying to get across. So it probably worked much better that way than if you tried to tell that same story but put it in the context of today's -- today's particular realities. Much better to disguise it as something in the far future or the distant past and let people draw their own connections.

Unidentified female: Might do that but don't tell anyone. That's a secret.

Unidentified male: Like the Manhattan Project.

Unidentified male: So I'm thinking it's more of this generational thing and what we need to plan for and I do think that the fear is an important thing to --

Unidentified male: It's in my experience I've dealt with students and things, younger folks, people like myself how they get sucked into the topic and how they start to go, "Oh my God this is important, this isn't just another boring" -- this isn't the tax policy of President Monroe, right? This is something that they see as being important and can I use the computer real quick?

Unidentified female: Do you want me to connect it?

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Unidentified male: While you're doing that Alex would you include James Bond in that space?

Unidentified male: I was thinking that too because it -- is it because the word "Soviet" is in there somewhere? Is that part of -- is it bomb fear or is it Soviet fear, what's the fear?

Unidentified male: Well that's a good question. So this is my little -- this is the [map](#) that I mentioned a few times that people have been looking at especially of North Korea, let's see if it works. There we go. Anybody got a city [02:23:55] you want to go to, particularly New York that's pretty well known by most people, right? So a lower Manhattan and go in here and we say, "How about a fat man bomb" and we click detonate and it shows you more or less the different effects. So okay the fireball was the actual fireball, the red zone is everybody is smushed, the green zone is radiation sickness, the gray zone is you're pretty smushed but not maybe completely smushed, then the building area. And then the orange zone is you've had your skin burned and your eyes are burned.

Unidentified male: I don't think that's a graphic enough presentation. I think we need more --

Unidentified male: Well you do this and you say look at these people with these bombs and they say like lower Manhattan gone, like that's not very good. But you can scale it up and you start scaling it up for like the Cold War, let's do the first H-Bomb and now we're talking about an entire region. We're talking all the boroughs are gone now more or less and you can scale it up; people love the big Soviet bombs. Go up to the big Tsar Bomba bomb and now you're talking about, you know what were, you know there's a whole lot of things gone.

And so what I've been interested in in looking at this, I mean I made this mostly for teaching originally. I made this stuff primarily because I wanted to show people why people who had already saw bombs that were this big were really horrified about the idea of setting off bombs that were this big and they saw this as being qualitatively and quantitatively different. That the H-bomb -- I did this in the context of the H-Bomb debate. This is what Rabi and Fermi are talking about when they say, "Welcome to Genocide" and things like that. That it's not just arbitrarily different.

What I've been struck by and how people use it and I can see this very clearly both from the very long of it that I have but also from the Twitter feed, Twitter is amazing for understanding how people use web sites because they constantly -- there's eight million discussions on this web site every day and people go "Oh my God this is so fun, or this is so crazy" but my other favorite comment is "Oh my God why does this exist"? Which is a very -- do people ask that of normal web sites? I mean this is a very -- does anybody question the existence of my web site before. Why does it exist? Why does anything exist? Because the Cold War did not -- and being hot is one answer.

My only point in bringing this up is I found this is a teaching mechanism to be extremely effective in part because it is drawing on fear. And not in a way that you wouldn't have to end with fear and I hope that this doesn't just end with fear. Interestingly people conclude very erratically different political interpretations of why I've made this. Some people say that I -- "Oh God, this guy made this because he wants us to bomb Iran". [02:26:55] I'll say explicitly, that was not my goal.

I've been really impressed by it that they get drawn by that and other discussions can occur. When the question of -- I think even as part of Manhattan Project Exhibit, especially for the Manhattan

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Project Exhibit maybe not necessarily with the space going to the full Cold War but getting into the international control question because this has happened during the Manhattan Project. This started in late '44 and has long lasting implications and it's very much behind the points of view of the people working on this bomb. And they're talking about what's the future going to be even though the bomb has never gone off yet. And I think that that's -- the fear is the way that they start thinking about it and I think that's a way to drop --

Unidentified male: So small point of presentation here, which doesn't have nearly the impact of what you're describing there. But you know one thing that you see a lot in science centers is to try to show you what you -- what your environment looks like to you is they'll take a satellite photo of your town and it gets placed on the floor. Then the kids can walk around it and look and see, "That's where I am" or you can do the same thing for that entire region that would cover the entire floor of the building. And say, "Stand here, stand well over there"; "That's how far it reaches if it's an H-Bomb". "Here's how far it reaches in your first example" and you could really display the extent to that impact just by -- by having the map on the floor and people walking around it.

Unidentified female: Oh then the kids fall down.

Unidentified male: Photos showing people have second, third degree burns; graphic yeah --

Unidentified male: That works very well on Saturday mornings with the family; yeah.

Unidentified male: The really graphic descriptions are -- some of the civil defense documents of how you dispose of the bodies and that brings it home. And there's a government document and explains -- it's called "A guide to morticians" or something like that. And it says -- it has lines in it that are just you may want to get a ditch digger; you know. You can only dig in a straight line you can just put them in end to end; this is really --

Unidentified male: There are comments about Sigmund Reese desire to have a war North Korean -- he said an atomic war you wouldn't have enough bulldozers to scrape all the bodies off the streets.

Unidentified male: Right, right.

Alexandra Levy: For conveying for younger people it might be really good to use movies that have come out, like -- there are parts of Dr. Strangelove that are pretty scary. And even shows like, I believe Battlestar Galactica which came out last decade, there's a nuclear war at the beginning that [02:29:55] wipes out most of humanity. I mean some of -- a lot of these -- I bet a lot of people will have seen that and I didn't watch much of Battlestar Galactica but I still remember this one image of a mushroom bomb off in -- a mushroom cloud off in the distance with all these people running away from it. I mean that image stuck with me, so just showing a few images like that from popular culture could be very effective.

Alex Wellerstein: Yes, a really interesting angle on this and that starts -- that we're -- the origin of which really is a Manhattan Project and that is -- I'm not much of a science fiction reader but I know that if the group of science fiction community led by Neil Stephenson and Rue Sterling and others are writing now about what they call techno-optimism, the loss of techno-optimism. Why is so much of science fiction today apocalyptic? Its scorched earth and then we rise from it. When in

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fact, science fiction historically was focused so much more on gadgetry and Tom Swift and James Bond and others and where is that in -- in the appreciation of science today, the future of science today?

I think it's true much of the apocalyptic styles, scorched earth started with the concept of what happens when you -- when you have a major bomb or anything of that scale.

Unidentified male: It started with H.G. Well's *The World Set Free* and a film that was made in England in 1933 while Leo Szilard was walking across the street thinking of the chain reaction.

Unidentified male: And that's a wonderful relationship to pull together. How is the public extrapolating from these very real experiences to what they -- in their minds they were seeing where this could go.

Unidentified male: And of course the visual possibilities producing clips from all this rich set of films as they are to from the museum.

Unidentified male: Test films.

Unidentified male: Yeah, that's -- I'm just thinking of all the Hollywood versions.

Unidentified male: There were films that came out in the '80's the day after and --

Unidentified male: Yeah.

Unidentified male: It may have to do with --

Unidentified male: The '80's --

Unidentified male: It may have to do with Reagan being selected President.

Unidentified male: Yeah, your perception --

Moderator: We may need to have one conversation -- the transcriptionist will go crazy.

Unidentified female: Can I just suggest another source for this in Paul Boyer's "The Cold War in American Culture". It had so many wonderful examples of science fiction and you know every day products and kitsch -- what we call kitsch. But many different kinds of things that would be useful in a museum exhibit if we went beyond the actual Manhattan Project about what was bought and sold and how people thought about it, both in the social ways and it's frightening --

Unidentified male: I'll say --

Unidentified male: By the bomb --

Unidentified female: Oh sorry, sorry *By the Bomb's Early Light*. [02:32:55], *By the Bomb's Early Light*, transcriptionist. Sorry about that.

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Unidentified male: Yeah, yeah.

Unidentified female: Paul Boyer, B-O-Y-E-R; he passed away five years ago I think.

Unidentified male: Along the same lines is --

Unidentified male: So folks it sounds like we -- we are -- we just still have a contextual issue here. I think when we come together at 2:00 or whenever we come together to talk about presentation we still have a contextual issue here about whether, you know where is the Manhattan Project in the level of our messaging here? Is it the top of the pyramid, you know and we want to show the things that culminate in what the Manhattan Project represents or is it at another level and things are extrapolating from it? It doesn't mean that we can't constrict our message in time if we want and let people derive what they want from it. But and I may be wrong by this -- this is you know an old man's best speculation on this but I think there's a difference between a metaphorical message that looks forward, an Avatar message from a metaphorical message derived from history. I have a feeling that young people will see a historical message at history. But they may see the message in Avatar because they're drawn toward it. They're drawn toward the futuristic aspect. Will they extrapolate the message for the future from a historical presentation? I think that's going to be a little bit more artful to get done. You know that's a knee/jerk reaction.

Unidentified male: Alan made an interesting point about historical understanding knowledge and context. People might know that the national report card issued in 2011 showed that high school seniors scored lower in their understanding of U.S. History than they do in their understanding of math or science. This is actually the area that they know the least of. Twelve percent of high school seniors were judged proficient in U.S. History. That 12% they asked them "What was involved in the Brown vs. Board of Education decision" and the answer was implicit in the way they asked the question only 2% could answer that. So we're dealing with quite a low level and I want to say people know more about World War II. I haven't found that out to be true at all. They know the mythology of World War II, D-Day, American heroism. They don't know who won the war in Europe. They don't know that the -- throughout most of the war the United States and the British were facing 10 German divisions combined while the Russians were facing 200 during that time. They don't know that the United States lost 305,000 or so in combat and that the Soviets lost 27 million. I mean they don't know -- there's part of the history, they don't know about the second front, so I think the level in which we have to start with [02:35:55] educating unfortunately is pretty basic on a lot of these things.

Unidentified male: What an amazing the -- statistic. You know picture the President saying, "We are 21<sup>st</sup> in the nation in stem"; I already did my diatribe on that yesterday on the importance of inspiration as well as testing is that issue. But picture him saying we know less about U.S. History; how concerned would the public be on those two fronts? One is but we need science to move forward, but no one is grasping the -- the perils of not learning from history. It's very, very interesting.

Alan Friedman: Just a comment on that because I'm a member of the National Assessment Governing Board so I get partially to blame for some of this and I'm the chair of the Assessment Development committee. One difference is that history tests covers history and it's back from Stonehenge to today. The science is really quite restricted. It's not even all science. There's no engineering in it, there's no technology, there's no math. The science really is a narrow set of hard



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sciences. So that's one reason why maybe our kids do a little bit better; we're programmed for a lot narrower field of knowledge.

But I would respond abroad frankly, I would much rather know history than not know the science and vice versa. So --

Unidentified male: I agree with you but it's something we don't say very loud.

Unidentified male: I agree, when my clients are in the room --

Heather McClenahan: Start a movement in making this group can help to put an H in there so that it's "SHTEM"; we can work together and—I talked to Richard about this yesterday: My hope for the future is there are 600,000 kids in the country who participate in National History day every year, programs in sixth through 12<sup>th</sup> grade where they do a project and they have to use primary sources and it is wonderful. And these kids really get it and it turns them on to history that even if they don't go into history -- if they're going into some other field they've got that background and they learn how to do critical thinking and they learn how to ask questions that historians ask. And so -- so there is hope for the future as many kids are participating and doing it. There are some amazing projects.

Unidentified male: You know one of the things that I think about is that we touched on this briefly this morning and I'm sure we'll come back to it is this concept of, for example, where the media fits in this and you know, the medium if you will. We -- in my association are doing a joint project with the national writer's project and I had some discussions with [02:38:55] the National Communications Association on this. In some ways maybe the thread in all of this is how information is conveyed. Whether it is placed in historical context in absolute terms we -- we received that information. If you looked at what information needed to be conveyed, what information needed to be held and how that would have -- how that information would have been disseminated maybe it's the writer or the communicator who is the most important player in all of this. And again, we can -- this can go in so many different directions but it could -- clearly that's what the museum is trying to convey to us. That regardless of the message, it's the communicator that is -- that plays the most valuable role in this. So we may -- we may have to get into that process aspect of these topics in a little bit more detail than we imagined.

Moderator: Again this is excellent discussion on -- you know we're not cutting this off. We're only -- time for the larger issues anyway which we get into -- which we'll get into. Unless there's some other -- are there any responders on this that haven't spoken?

Unidentified male: Yes.

Moderator: Okay good.

Unidentified male: I take Alan's point that one has to be careful where to put the full scope period of this exhibit. And as an extension of the Manhattan Project it would seem to me that the first period of American nuclear monopoly is one which is directly flows from -- from the existence of the project. And one could look at that in different -- different ways and different levels. As far as the general public was concerned I think one thing that had a tremendous impact was the

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publication of John Hershey's book "Hiroshima in 1946", which for the first time humanized the Japanese and led to a certain degree of contrition. And there were the -- the survivors from the bombings who came to this country for plastic surgery and were featured in Time Magazine and generally for the first time brought home the horrors of the dropping of the bombs.

And then the question of whether the nuclear monopoly and general Groves' efforts to keep it American how far did that succeed in making Americans feel safer? And the Gallup polls I think [02:41:55] at the time suggested that it didn't. That a year after the droppings of the bombs the American's felt less safe because they'd come to the realization that some point someone could drop one on us. And then at a -- at a political level you have the same concerns about monopoly both amongst allies and potential foes. So the -- it was a major motivation for the British to develop a weapon that they recognized that without a weapon they have no restraining influence on the United States.

There was a rather dramatic period during the Korean War when we thought that the American's might be about to use the bomb and Utey flew to Washington to intercede with Truman. Prior to that the time the Berlin blockade, I think Secretary of Defense Forrestal made the case for the custody of the -- what nuclear weapons there were to be handed over to the U.S. military. And Truman said, "This is no time to be juggling forms around". So there were all sorts of consequences of the American monopoly which is something that Burns and Groves would have preserved in perpetuity if they'd had their way.

And of course the -- you know no more impact on the Soviets. I think one of the things about the conservation on the Manhattan Project is that we tend to concentrate on the warhead whereas a lot of the strategy and debate actually rest on the means of delivery. The Americans always seem to say that it was going to take the Soviets another five years to develop the bomb; so when they actually did it in 1949 it came as a total shock to Washington, which is an interesting thing.

Truman after he left the Whitehouse actually doubted whether they'd really explode a bomb. He said even in 1952 or whenever he said that he really doubted whether the Soviet scientists and engineers have the know-how to make such a complicated weapon. So I think the period of the U.S. monopolies is a very important one and you know, the obvious thing for the Soviet's was that they were surrounded by potential U.S. launch pads in terms of having air drones in England or have you where a bomb could be delivered against them. It was part of the American war plans and it was seen as a [02:44:55] potent weapon of attack. And all that changed once the monopoly disappeared.

But it just seems to me that is a very important period after the Manhattan Project.

Unidentified male: He makes a lot of interesting and relevant points that I'd like to pick up on. One during this monopoly period Leslie Groves writes a memo in I think it was December 1945 in which he says, "Thinking about the Soviets that if any other country looks like it's developing atomic weapons we should attack preemptively". So I mean there was that sense right from the beginning about the American monopoly and kind of preemptive attack against the Soviet Union. The point about Hiroshima is very important for this -- the book Hiroshima by John Hershey is very important for this project because when the bomb is first dropped 85% of the public was in favor of it, 23% or 22.7% of the public said they wished the Japanese had not quit so quickly so we had a chance to drop more atomic bombs on them. In the southwestern United States 30% felt that way. But then after Hiroshima was written by Hershey in August of '46 the public reacted very strongly

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to that and it was then that Conant wrote to Stinson and instructed him or urged him to write the official narrative. That the idea that we dropped the bomb and talking about yesterday in order to save all these casualties and an invasion; that's in response to Hershey's Hiroshima. So that's very important story.

Another story that -- along those lines was Truman's reaction when he met with Oppenheimer shortly after the war and he says to Oppenheimer the first time he met him, he says, "Tell me when do you think the Russians are going to develop a bomb"? Oppenheimer says, "Well I don't know" and Truman says, "I know, they're never going to develop a bomb" and Oppenheimer was so thrown by this that's when he says, "I think I've got blood on my hands". Truman says, "Don't worry about that the blood's on my hands" and afterwards he says -- he called him a crybaby scientist and he says, "I never want to see that son of a bitch in my office again".

Unidentified male: Yeah, yeah.

Unidentified male: That immediate post war period and the monopoly is very interesting for what develops afterwards.

Unidentified male: What I was going to say is that if you look at this as a history -- history exhibit Alan's right, you need to stop; you know somewhere you have to stop. You can't keep going, going, going. But you know if you look at the underlying part of the science and the information and the flow of information and how, you know the secrecy ties in and the compartmentalization and everything. And then you look at how you kind of open that up and even today you look at computer programmers with open source software, you can definitely tie that in through the Cold War and onto the day.

Unidentified male: You know I can be completely off base there and it's my own biases coming in but I just feel that somewhere in this -- the fact that we -- we had to examine our trust and respect across the entire science domain where the Soviets were concerned is a relevant outgrowth of this experience. I mean we -- we lost faith in our ability to communicate across anything -- it wasn't even -- we saw a threat in everything. And so you know if medical scientists got together, the core scientists understood that there's valuable information on -- on both sides. It wasn't communicated very well [02:48:55] so the first office --

Unidentified male: Yeah but it was a Soviet scientist who gave that to us. And so you know, we had to re-establish -- the scientists hadn't drifted that far from the center. But the public had drifted far enough from the center that it was really the science communication really became an important issue here. We had to explain to them that yes, it was okay to work on oral polio vaccines with Soviet scientists. And to -- to take meteorological predictions, you know they were doing three, five, seven, ten day meteorological observations all through the 1950's and publishing them, it was all valuable information and we were using it. But the public significance "Soviet stuff, can you really trust that"? You know we were seeing an awful lot around every corner and it all derives from exactly this suspicion. Somehow we need to convey that as well.

Unidentified female: I would just still reflected today when you have people in Afghanistan being killed because they're delivering polio vaccines, right? There's that not trust in that science you're trying to hurt us with your science instead of help us.

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Unidentified male: Yeah, yeah. I want to pick up on what Alan said a few minutes ago is that somehow we're still blowing up the balloon and we've got to get it back to a manageable size. And then also to thinking about what is it that is, if you will marketable and what does the museum world, whether they're primarily history museums, science and technology centers. What is it that they are going to be responsive to? Now Cindy's worked really hard to get us to this point to where we can have these kinds of conversations and be bringing together these -- these various perspectives on the Manhattan Project. But if we're going to take it to the next step we've got to -- we've got to have this put together and presented and described in a way which is going to make it accessible to these populations that we're talking about. So I see the need for -- and maybe this is part of what we do in the next couple hours is to try to think from the perspective of the venue that we're hoping that we will be able to reach. Or what is it that we can -- how can we take this stuff and format it in a way that's going to be desirable for the recipients?

Unidentified male: I think that there's a -- a balance point; there is from a historical point of view there is ample justification for focusing on the Manhattan Project and it's immediate aftermath or the run up to it. And the reason for that is that there's -- this is probably one of the most well momentous projects that have gone on in the twentieth century, maybe nineteenth and twentieth century but it's not [02:51:55] that story hasn't been told and we have this plethora of atomic museums around the country and they each tell it from their own standpoint and kinds of presentation. But there's no national narrative about this to explain why this is important, what if -- even what it was about. So this is an amazingly neglected event I think in the national --

Unidentified male: One of the biggest events in the twentieth century --

Unidentified male: Twentieth for sure and now you've got things at World War II and you've got lots of things -- we said to you, "What is the Manhattan Project have to do with World War II" and there's an astounding level of ignorance. So I just think that there's -- there's just huge historical justification for looking in this complexity. And to do the complexity it seems to me you really need to have that kind of focus, but you can still draw lessons about today and not just the Cold War, but I think today. And I think that can be the way you draw history lessons from Thomas Jefferson and any of these kinds of things. But I think there's a very good argument for doing this as a historical --

Unidentified male: I would say one of the challenges that we face here is the issue of the why and the outcomes. I think there are many museums out there that will say, "Okay structurally we've described the Manhattan Project". The people had to come together, here is the tools that had to be -- had to be developed, here's some sense of the context in which this occurred particularly if it's site specific and since some portion of it was done here. So if it's just a question of saying, "What was the Manhattan Project structurally"? I think we have lots of demonstrations even from representatives here who have this within their -- within their museums. But this whole, what does it mean?

Unidentified male: It's a national thing pulling these together; these are total like a mosaic the way it is right now and I think you need some kind of -- looking at this from a -- from a national cultural perspective, social/political perspective.

Unidentified female: I -- you know I just -- I start from kind of the different position I think on it and I -- which is that I think it's hard to teach people historical events without the putting the cart

and the horse in a different direction. Without -- the question is sort of “Why would they want to know about this”?

Unidentified male: I’m not saying that --

Unidentified female: No but --

Unidentified male: Simply saying where you focus your historical study and then of course out of history you draw these lessons about today and -- but I’m just saying let’s not do the whole Cold War after it --

Unidentified female: Sure I don’t think we’re going to do the whole Cold War, but I don’t -- I guess I don’t hear people saying, “Let’s do the whole Cold War”. I hear people saying there was a particular kind of science that this developed and there were certain kinds of things that are coming out of it. We’ll hear more of that I think this afternoon when we talk about something that’s really not been discussed very much at all, which is the biological sciences in this time period. But I guess I’m just thinking that it would be -- yeah, well I mean I have a different view, which is that I would prefer a museum that actually had particular features of the Manhattan Project that we talk about and really [02:54:55] nail down this is what happened etc. And then also what difference does it make that this thing actually happened. And one way to think about it is that it’s the epilogue, right? So it’s own small room or whatever else and another way is to sort of draw the threads out across steam. So anyway it’s just different things --

Unidentified male: I don’t -- I don’t think we’re thinking and saying different things myself --

Unidentified female: Yeah I guess only when I hear the one ideas just to say, “Let’s start in 1938 and end in 1947” --

Unidentified male: Well that’s a huge historical gap in the national -- even basics on this thing.

Moderator: Let’s see has everybody responded? Did you -- responder; okay great, terrific. Good job. I think it might be good to start the next presentation. We keep drifting into the large picture which is wonderful and that’s one reason it’s not to jump into the larger picture it’s just because these specific ones raise all these questions and issues and enlighten our thinking. So I’d love to—if you have the patience to see if Angela is willing to step up there and start the next session.

### [Lessons from the Manhattan Project by Angela Creager and Arthur Molella](#)

Angela Creager: I guess I’ll go ahead and get started. I’ll mention that I -- I decided to do something a little different with my presentation than I did in the write up that I gave you because I realized that the kind of material that I work with is just kind of -- it may be unfamiliar to many of you. So rather than reflect on my material I thought I would use a set of pictures to take you through the material that’s my forthcoming book called, “Life Atomic”, this is a history of radioisotopes and science and medicine.

I’d like to start by saying I focus on not causes or the creation of the bomb, but rather it’s consequences. And I would just echo Andrew’s observation that the early Cold War period, and especially the period of American monopoly is an extraordinary important period for registering

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what the consequences were of the American -- of the Atomic Energy Act and of the various other constraints that were set in motion and the national security stay. But I look not only as the negative consequences but some of the positive consequences which often aren't attributed to atomic energy. So that will kind of be my take.

And I have a whole series of pictures so you know. The May 3, 1947 issue of Collier's Magazine included a special feature called "Man in the Atom, an Introduction to a Golden Age". The section included an essay by science journalist by Alfred Q. Maisel which was entitled "Medical Dividends" and it's illustrated by -- by the way you can see the illustration for this section of this article by David Lilienthal and another article are not this, which shows the destruction of a Japanese city on the left but this power plant on the right. This is the Golden Age.

So the essay on medical dividends is illustrated by a remarkable composite photograph, if I can get it to come up. This is not an ironic image -- this man is standing up from a wheelchair beaming exaltedly in the radiation of a mushroom cloud that encircles him. The article touts the forthcoming medical benefits of atomic energy. As it says the first benign results of atomic bomb research have been neutrals for medical scientists which promise cures for incurable diseases; that's a code word for cancer there. There have been failures but the work has just starting and researchers are generally hopeful. The reason for this hope, radioisotopes. As Maisel goes on to explain, "For to scientists radioactive isotopes are tools of power in the eternal fight against pain and death. They may even be a means of prying open the once tightly shut door to an understanding of the inner processes of life".

Now the striking optimism about the healing power of radio isotopes updated and reinforced four decades of effort to harness the therapeutic promise of radioactivity. As you all know Marie and Pierre Curie [03:00:40] discovered radium in 1898. Clinicians began using it during the first years of the new century following in part the pattern set by x-rays. Physicians used radium to treat a wide variety of conditions from acne to hemorrhoids but its dominant use was an alternative or supplement to surgery, especially for cancer. But its therapeutic use is also found less authorized venues. Radium was an ingredient in popular nostrums that were sold in the 1920's such as radiothorium, this one which had radium in it actually poisoned socialite Even N. Meyers and so drew some attention to the dangerous properties of this elixirs.

I'm -- I owe that fact to Sam Walker one of the book permissible dose. Radium entered industry helping to drive the price to \$180.00 per milligram at the time of World War I and ask you know its widespread use in luminous paints led physicians to recognize the peril of ingesting radium, which was made vivid by the tragic deaths of young woman dial painters.

In the 1930's our official radio isotopes first produced from small neutron sources and then from cyclotrons and here you see the 27 cyclotron with E. O. Lawrence and his graduate student M. Stanley Livingston it's inventors beside it. These were also rapidly taken up into medical research and therapy. E. O. Lawrence declared and in 1934 that radio-sodium manufactured in this Berkeley laboratory had properties superior to those of radium for the treatment of cancer. Sodium 24 which could be produced from table salt was also a fraction of the cost of radium. In his radiation laboratory at the University of California Berkeley physicians John Lawrence, his brother and also Joseph Hamilton made the first attempts at therapy with phosphorous 32 and sodium 24. Both given initially to Leukemia patients. But they were also taken up in biological studies and here you see a classic example Joseph Hamilton is drinking a solution of radio-sodium with his hand in a lead

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encased Geiger counter. And the whole point of the demonstration is to see how many minutes elapse between the drinking of the radio-sodium and the you know, chattering of the Geiger counter due to the radio-sodium reaching his extremities, his hand. And it's just a few minutes were required.

Another radio isotope that was used early on -- oh I wanted to show you also this is a picture of radio phosphorous, phosphorous 32 which has been given to a tomato plant by researchers in the division of truck crops of Berkeley and you can see from this audio radiograph that the radio -- the radio phosphorous is concentrated in the most rapidly growing areas of the plant in the foliage. In addition radio iodine began to be used; especially iodine 131 to treat and diagnose thyroid conditions and this is kind of a classic picture of a little girl who has been given radio iodine and the Geiger counter in front of her neck to pick up the counts as they reach her thyroid.

The growing clinical demand for radio isotopes was disrupted by the Manhattan Project which [03:03:40] reoriented cyclotron based physics because there was already quite a bit of use of radio isotopes in the late 1930's and early 1940's. And there was a whole network of distribution out of Berkeley and around some other cyclotron's as well like Wash U. But as cyclotrons were used for the war effort this distribution network was disrupted.

Now nuclear reactors which were built to product plutonium made possible the industrial scale production of radioactive isotopes, but only select military personnel and a few scientists even knew of their existence. And here you see the building constructed and a bridge to house X10 the graphite reactor and here's the loading face of the graphite reactor.

Now the terrible human toll of the atomic bomb detonations over Hiroshima and Nagasaki did not lessen the prevalent hopes that these novel sources of radioactivity would revolutionize medicine. If anything I'd say the new scale of atomic energy heightened the level of expectation. And what I want to show you as a part two that was run in the Dallas Morning News just a few days after the Hiroshima explosion; so this is even before Nagasaki, before the surrender and you see cancer as a skeleton being you know, devastated here by the rays of atomic energy. As medical physicist Robley Evans asserted in a 1946 article in Atlantic Monthly the sober truth is that through medical advances alone atomic energy has already saved more lives than were snuffed out at Hiroshima and Nagasaki. He didn't produce evidence for that. I think it's probably quite an exaggeration but what I want to capture here is just the sense of tremendous hope that cancer was going to be the next victim. We could mobilize atomic energy against that terrible enemy.

The following year Everett Dirksen famous representative from Illinois persuaded the Atomic Energy Commission to earmark five million dollars for cancer research since radioactive materials comprised as he put it the essential point in this whole cancer business. And he went on to say, "If we are going to spend a few hundred million dollars in the atomic energy field to perfect and instrumentality of death then let us take a little of that money to develop and instrumentally to preserve life". And radio isotopes in particular seem to provide a way to redeem the destructive uses of the atom.

Now after World War II the facilities of the Manhattan Project were transferred to the new civilian, not only civilian government agency, the AEC which was charged with the peace time development of atomic energy as well as with the continuing manufacture of atomic weapons. Now even before the new agency was founded leaders of the Manhattan Project had decided to make the original

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large scale reactor, the X-10 reactor at Oak Ridge, a radio isotope production site to supply civilian institutions. And this was announced in June of 1946 in an article of science that effectively became the first catalog for radioactive isotopes [03:06:40] produced by the government. I've underlined the first line, I think it says, "Production of therapeutic" -- I can't read it from here but anyway --

Unidentified male: Based on therapeutic radio isotopes.

Angela Creager: Is kind of the first -- the scene is kind of the great herald of the chain reaction pile. And as soon as the Atomic Energy Act was passed and signed by Truman at the beginning of August that set up the legal conditions for the first -- or for the distribution of radioactive isotopes. And so what you have here is the first shipment being made right in front of the X10 reactor. Eugene Wigner is giving a military carbon-14 to E. V. Cowdry who was a cancer researcher from St. Louis while other people look on. Of course this is not just because Cowdry happened to be down in Oak Ridge; this is a photo opportunity that's staged for the launch of the radio isotope program and you can see all the journalists and newspaper men and photographers crowded around the X10 reactor as this stage shipment proceeded.

The head of the isotopes division and a lot of radio isotopes went out and just to give you a sense 10 years later here's a picture of the isotopes kind of shipping realm in 1956. And here is a graph of the Curie's radioactivity that went out in the form of radioactive isotopes to Oak Ridge. This is cumulative but still you can see the enormous growth from 1946 to 1956. About 64,000 shipments went out during this time period. That doesn't represent the number of final recipients because many of the shipments went to companies which prepared radio label compounds; so there's a retail market as well. The head of the isotopes division estimated that there were 50,000 shipments for radio isotopes reaching end users in 1956 alone. And these radio isotopes were used in more than 10,000 scientific publications during the first decade of the AEC's program and the vast majority of these originated in that Oak Ridge reactor.

I want to say a little bit about the consequences of radio isotopes for post war science and medicine. These radio isotopes could be used in one of two ways. Like radium they could be employed as a source of radiation as in cancer therapy. But isotopes also gave researchers a way to tag and follow atoms through chemical reactions or biological systems to make physical things that have previously imperceptible. And for this reason radio isotopes were frequently compared to microscopes as the AEC's 1948 semi-annual report emphasized as tracers they are proving themselves the most useful research tool since the invention of the microscope in the 17<sup>th</sup> century. In fact they represent the rarest of all scientific advances, a new mode of perception. And I'll just comment that there's kind of cursiveness to my own book because what I am doing is using these radioactive isotopes as historical tracers to see their movement [03:09:40] and circulation through the United States and indeed through the world as they went into government laboratories, clinics, other kinds of facilities to watch the way in which they were used and also regulated to make visible key transformations in the politics and the epistemology of post war science and medicine.

And I argue that radioactive isotopes were really a key ingredient in a new post war episteme of understanding life and molecular terms. So I just want to give you a very few examples of some of the fields that were really quite transformed by the availability of radio isotopes from the U.S. Government. First of all biochemists were already using radio isotopes as well as stable isotopes in the 1930's. But their use in biochemistry really spread dramatically in the post war decade. And this is a table from a book that was first published in 1958. The author Broda went through you



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know four leading biochemistry journals from different countries and just tallied up the percentage that used either radioactive isotopes or stable isotopes. And you can see the journal of biological chemistry which is the main organ of biochemistry in the U.S. already 1% of the papers used radioactive isotopes in 1945, which is a testimony to how many cyclotrons there were and the fact that a few scientists were getting them for cyclotrons.

But by 1956 only 39% of the papers were using radioactive isotopes which is really a remarkably quick penetration of the new tool in the field of science. And stabilized isotopes were being used in an even higher rate in 1945 that didn't, you know they were really overshadowed by radioactive isotopes because of the AEC's distribution program. By contrast none of the other countries had, you know any substantial use of radio isotopes at all in 1945. And only Britain had a substantial increase, it went up to 18% of the papers in their journal of biochemistry.

One of the classic examples of the success of radioactive isotopes of biochemistry was the elicitation of photosynthesis by Melvin Calvin who came up yesterday and his co-worker Andrew Benson. Calvin and Benson used a single cell clean algae corolla which was grown in a culture suspension as you can see here like a microbe. And what they would do is supply these corolla and this is Calvin next to some tanks of corolla. They would supply the carbon dioxide with labeled C14 and the point was -- in this lollipop apparatus that was developed it would illuminate the chlorella so that they would all be photosynthesizing actively. And then injected carbon 14 labeled carbon dioxide which would then be taken up rapidly by the algae and then after a certain amount of time, five seconds, 30 seconds, a minute or whatever the algae would be killed and their contents run on two dimensional paper chromatography. And then the radioactivity assessed by just putting, you know photograph paper, or film paper over it or film over it. And by tracing or by just measuring [03:12:40] how these dots which represent different chemicals have taken up C14. The movement of the radioactivity among these dots Calvin and Benson were able to reconstruct the movement through the photosynthetic path. And Freeman Dyson who gave -- who saw a lecture that Calvin gave on this in 1948 was especially impressed by this and you know what; I'm not going to be able -- I'm going to ask somebody to be Freeman Dyson and read the quote because it's too far for me. So if I could designate someone to read this quote; it's a great quote.

Alexandra Levy: The long-sighted people said when nuclear energy first came on the scene that the application to biological research will be more important than the application of power. But I doubt if anyone expected that things would actually get going as fast as they have. This blotting paper plus radioactivity technique is completely revolutionary because it means that any substance can be fed to a cell and its transformation followed second by second in detail. Even in quantities too small to be seen or weighed and with substances too unstable to stand old fashioned doing a chemical extraction.

Angela Creager: Great, thanks Alex. So this is the photo -- the photosynthetic pathway that was deduced by Calvin and Benson using this technique. And I should mention that it wasn't just Calvin and Benson, many biochemists were using radio isotopes in this time period to work on intermediary metabolism; there's kind of a proliferation and metabolic pathways that are deduced in this time period. In large part because of radio isotopes.

Biochemistry wasn't the only field that was really transformed in biomedicine by radioactive isotopes and I don't have time to talk about some of the other examples I developed in my book, but I just wanted to give you a couple of images. This is Rosalyn Yalow with probably iodine-131 and

that bottle there, she was a young physicist who worked with Solomon Berson at the Bronx Veterans Administration Hospital and through their work using radio iodine understand insulin. She and Thurston developed radio-immuno assay as well as doing a lot of important work in endocrinology. This is clinical experimentation in which you know, these clinical subjects, these veterans really were kind of chi to the growth of endocrinology and the development of this new tool.

In addition I focused mostly on tracer uses but the use of isotopes as radiation sources was also extremely important in the post war period and especially cobalt-60. And here you see a Westinghouse cobalt-60 teletherapy machine from the 1950's. This is -- the development of cobalt-60 therapy has kind of a dark side because it was used not only for targeted therapy but also for total body and radiation. And the military underwrote many experiments which showed how, in this case cancer patients reacted cognitively and physiologically to high doses of radiation and effectively this was used to try to inform military decisions [03:15:40] about you know, how long a pilot might be able to fly a nuclear plane for instance because there was a project to try to develop nuclear planes or how long soldiers could be on battle fields after that nation and be able to still take orders. And some of the concern about healing radiation experiments was about these kinds of experiments which were done on patients often without their knowledge, they were also research subjects.

I'd like to talk just about one other example of a really important contribution and this is in ecology. So this is G. Evelyn Hutchinson who early on was inspired by the way in which biochemists were using radioactive isotopes even before World War II and so he set out to use radiotracers and the menology, the study of bodies of water. In 1941 he added phosphorous 32 to Linsley Pond in Connecticut to follow the cycling of phosphorous through phytoplankton and inorganic matter. And he did the experiment again in 1946 with more radioactivity or more phosphorous 32 from the cyclotron at Yale. And he specifically saw this as a way to get at what he called the intermediary metabolism of the lake. So this body of water then was like the body of an organism whose chemical inner relations could be studied by using radio tracers. And after the war Hutchinson who was one of the great ecologists of the twentieth century was among the earliest licensee to receive radio isotopes from the AEC's Oak Ridge isotope branch. And he used this higher specific activity radio phosphorous to continue his study of phosphorous cycling in the lake. And this had an unintended and kind of ironic effect on ecology because Arthur Tansley had introduced the term "ecosystem in 1935" to try to rid ecology of the kind of vitalistic and idealistic overtones carried in the term biological community.

But Hutchinson's use of isotopes to trace out the metabolic pathways and ecosystems kind of kept that organism metaphor in play. And in addition the representation of practices of -- oh and here you have the quote of Hutchinson reviewing a book by Clemens and Shelton saying if this is -- as indicated the community as an organism it should be possible to study the metabolism of that organism. And that was exactly what he was doing with radio tracers. But he also picked up on the kind of diagrammatic methods that were being used by biochemists to show the cycling and materials and atoms in metabolic pathways to depict biogeochemical cycling. And in this case this is actually the global biogeochemical cycle of carbon, which he presented at a meeting in 1948 in a famous paper. This actually shows two sub correcting systems in the carbon cycle, the circulation of carbon through the air, sea and sediments in one cycle and also the biological cycle involving photosynthesis. And I just showed this to indicate to you that ecologists like biochemists were interested in showing chemical change over time as pathways through space often traced out [03:18:40] through the use of radio isotopes.

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Now of course not all radio ecology experiments involve the intentional release of limited amounts of radio isotopes into the environment. Radioactivity was entering the environment on a very large scale through the AEC's disposal of nuclear waste and atomic weapons test and ecologists within the Manhattan Project and then the AEC began to track the movement of this radioactivity. And in this respect ecological tracing was very directly connected to the military uses of atomic energy. And I just want to cover one important discovery at Hanford; ecological research actually began at Hanford during the war as the massive plutonium correction facilities were being built; so that last slide shows you intakes because it was -- water from the Columbia River that pulled the fuel cells. And already during the Manhattan Project there was uncertainty about whether the effluent that had been passed through the fuel cells might become so radioactive as to harm the fish in the Columbia River. This was not because Leslie Groves and other leaders of the project were such environmentalists that they were worried about that. But the fishing industry was a huge industry; it was an eight to ten million dollar a year local industry. And if the fish began to die, and the fishermen couldn't get the salmon it would first of all, have a dramatic negative impact on the local economy but it would also begin to get people interested in what was going on to kill fish.

So he set up a group to begin to study the effects of radioactivity on fish, Donaldson at the University of Washington and persuaded Groves to set up a research site right in Hanford that could study not just do laboratory studies but also go out and begin to collect wildlife and begin to look at radioactivity in the eco system of the Columbia River.

Unidentified male: Excuse me, could I just ask did he foresee that or did problems emerge and he said, "Uh oh, we need to get on this"?

Angela Creager: My understanding is that he foresaw it --

Unidentified male: Really?

Angela Creager: Yeah.

Unidentified female: Very early on, very early on.

Unidentified male: That's pretty neat.

Unidentified male: Water was allowed in city and retention basins for a few hours.

Angela Creager: Yes. So what Richard Foster who had been a student of Donaldson began to discover along with some of the other researchers at Hanford was that the -- well first of all there was enormous amounts of radioactivity that went into the river and this DOE craft just shows how much plutonium -- weapons grade plutonium was being manufactured. So that by the mid 1950's it was about 8,000 carries a day that were going into the river. Now most of this radioactivity is not contamination. This is what I want to emphasize. The radioactivity is because the -- the exposure to neutrons and the fuel cells over radiated so many minerals in the water that you know; it produced a lot of radioactive isotopes. And even uranium natural -- so called tramp uranium in the water was being found, you know radioactive. And at first the [03:21:40] scientist worried that it was contamination, but it wasn't. It was just because of the radiation of the elements in the water.

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So the studies that Foster and his colleagues who conducted over the next several years showed a very disquieting result. They would go out and collect plankton and other you know, animals fish and such from the river and then analyze the radioactivity in the various organisms. And they found that radioactivity concentrates as it moved up the food chain. And this crucial discovery was already reported in a Hanford internal document as early as 1946. But it was classified until 1955 when the - - some restrictions were lifted in association with the atoms for peace program. Even plankton could concentrate radioactivity more than 1,000 fold; so one Hanford scientist described algae as a liable source of radioactive contamination of the river economy.

And the bio-concentration continued up the food chain with fish and water fowl and I don't know if you can see this chart very well, this is from E. P. Odum's 1959 addition of his ecology textbook. But he showed that for several food chains, not just the aquatic food chain but also the terrestrial food chain involving rabbits who would ingest iodine 131 from the plants and then were eaten by coyotes. You see the same movement of radioactivity of that food chain as well.

In this slide Odum who was a very, you know very closely involved with the AEC and did a lot of radio ecology himself to conclude thus an isotope might be deluded to a relatively harmless level to the environment, yet become concentrated by organisms or a series of organisms to a point where it would be critical. In other words we could give nature an apparently innocuous amount of radioactivity and have her give it back to us in a lethal package.

And then this scientist -- the Hanford scientists were always reassuring the public and the agency that none of the levels were dangerous [03:23:40], but Odom realized I think -- began to realize earlier than some of the others that there was a potential here for contamination that could be dangerous to animals and even to humans.

And the reception of the finding when it was published was undoubtedly sharpened by the fact that when this finding of bioconcentration finally came out in 1955 that was also during the beginnings of the debates over radioactive fallout, which already was focusing attention on environmental contamination and the hazards of low level radiation exposure.

And part of what I want to emphasize to you is that there was already interest by ecologists in using these radio tracers and in fact you see this interest going right up to the 1960's. Here you have an ecologist in Wisconsin who is about to put some iodine 131 into a lake in order to understand how the movement of materials and the like happens over time. But obviously the existence of places like Hanford brought these ecological problems to the core. And Oakridge as well was a tremendous contributor to the growth environmental knowledge in the 50's because of the need of the AEC to study what was happening to radioactive waste.

So the environmental bio concentration of radioactivity around Hanford ended up being published just before Disney released our friendly atom. So you see both kind of the sunny and the dark sides of this civilian development of atomic energy, which was being pushed by Eisenhower at this time.

Now the growing awareness of hazards of low level radiation -- radiation did not lessen the demand for radio isotopes among scientists and physicians. The fact radio isotopes were used more in the 60's and 70's than they had been in the 50's. They were really wildly established in a whole variety of fields. They were absolutely critical tools for research and also for new forms of medical treatment. But this changing worry about radiation safety did change the political value of being

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able -- being the supplier of radio isotopes. And particularly as U.S. was seeking to transfer nuclear technologies and materials to the developing world through atoms for peace; so that by the 1970's the image I showed you at the beginning of the man standing up from the wheelchair kind of exaltedly and the mushroom cloud would have become inconceivable. Radio isotopes had gone from being seen as curers as being seen as contaminants or poison. And so this change in perception complicated the agencies plans for advancing the other dividend of nuclear energy, mainly nuclear power.

But part of what I want to show in my book is that the predominance of negative images or radioactivity since the 1960's and 70's has led to a cultural forgetting of the vision of atomic energy and it's kind of transfigurative possibility that went before. And not that the dreams were fulfilled, radio isotopes for instance did not vanquish cancer in ways that Dirksen and others hoped. But the U.S. governments to promote the utilization of radio isotopes had an incredible impact on biology and medicine after World War II. And that -- those accomplishments need to be remembered alongside the more negative consequences of atomic energy as part of a very complex legacy of the atomic bomb. And in passing I'll just mention three issues of complexity that came out to me as I was completing my own study that I think are germane for how the Manhattan Project has presented to the public.

First is the inevitable overlap of military and civilian activities, in particular spheres. Now I'm looking at radio isotopes which is kind of the most civilian end of the atomic energy commission. But even there as has become apparent in the publicity around human radiation experiments there were uses of radio isotopes that also had military interest and support as well, human experiments.

Another is the issue of continuity versus discontinuity. The Manhattan Project when we think about the weapons of atomic bombs tends to focus [03:27:40] attention on the dramatic discontinuity that's posed by atomic energy. But in the area of medicine there are many more areas of continuity because of uses of radium and x-rays earlier. So it's not always a sharp story where the atomic bomb changes everything, in fact often the kinds of exposures that people were worried about in the 50's were just, you know continuous with earlier forms of exposure in the 1920's, especially as x-rays became more prevalently used by doctors and dentists. Not to mention, you know shoe salesman.

And lastly is the issue of radiation safety, which I haven't done any justice to but Kelly's mentioned it a few times as well. I think the point that I would want to make is that because of the enthusiasm about atomic energy and the political desire on the part of government on showing that it had benefits and dividends for the civilian center and applications often ran ahead of knowledge. And enthusiasm sometimes out stripped caution. And it's because so much of this was driven not so much by the military needs or demands or requirements but by the politics, by an attempt to justify the uses of atomic energy and its development by showing it could have good outcomes as well.

So I'll stop there; I've gone on longer than I intended. So the overlap continuity versus discontinuity and radiation safety; those were the three I meant to highlight. I'll turn it over to you Art.

Art Molella: Okay. Mine is for something completely different. But just briefly just mentioning in passing some of the things you do; you've got my statement in the book and I'm not going to repeat that and I don't have any pictures to show you because well, Alan had some of the images of the

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show I'm going to talk about and I'm going to gloss on what I wrote -- actually on this exhibit and I took as the assignment what are the lessons for the Manhattan Project. I'm really looking at this specifically what are the lessons we learned on the Manhattan type project exhibit for today because I did learn some lessons from that -- the Smithsonian did.

Just briefly the exhibit I'll be talking about is science and life and the Manhattan Project was a pivotal point in this exhibition. It was done in -- it was open in 1994, but right in the shadow of Enola Gay sort of thing. Right across the mall from me; this was at the Museum of American history. I wish I could tell you to go down and see it but it closed last year but after a decent run -- 15 years or so. It's in the past, but I still have her with me I have to say.

What I wanted to talk about just briefly is this is a cautionary tale but not in any way a recommendation that we shouldn't do the Manhattan Project exhibit because I dearly wanted to follow this up with an exhibition with some Russian colleagues [03:30:40] and look at it from the Russian side and the American side of things, popular culture and the whole bit. So it's something that is dear to my heart and we should do -- but it's cautionary in the sense that I think there's a tremendous potential for misunderstanding with the topic of this heavy, this difficult and this froth in American history and I want to talk about some of those.

Just right from the get-go you may not know this but sort of contextualizing exhibits is not that old of a thing. And the typical exhibit would be show you something of a label just identifying it and for better for worse in the '80s the Smithsonian and other museums began to get involved in narratives around exhibits and that's contextualization interpretation. And I've written about this; I've co-authored article on stories about this -- we call this telling stories. This Smithsonian is still very big on that, lots of museums are very big on telling stories because they involve people, they attract people.

Once you're in for that, you're in for some problems of interpretation. We saw this in a big time with the Enola Gay but in kind of a -- somewhat lesser way with science in life. It's an exhibit that came under quite a bit of criticism at that time, mostly from the scientific community. In the newspapers you probably didn't see it because it just overshadowed everything, but I've got a pile of things from newspapers that -- but one of the first, as soon as you start interpreting this you get immediately into discussions of revisionism. This became the -- this became the scare word of that period and continues to some extent. The ideas -- yeah there's the correct narrative of how you know, the dropping of the bomb played out but then we have these revisionists that are coming in with a political agenda. And I remember a moment I went up to the Hill to hear the hearings on the Amalgamate exhibit. Not my exhibit, but you can transfer all these things to what we did as well.

There was a moment where we're usually a right thinking person, Dianne Feinstein commented on this, by the way this is a very negative hearing and it was run by Ted Stevens at that time. And I remember one of the -- the co-curators of the exhibit, Michael Neufeld, was Canadian and Stevens said, "Why do we have the Canadian talking about American things, especially this?" Because that's where all the Vietnam -- you know the people fleeing Vietnam went to from America people didn't want to—you know, draft dodgers—but Diane Feinstein said, "You know what I don't get about this is you know, I went to school -- I went to College" was it Berkeley? I don't know but I think it was Berkeley and she said, "I studied with X famous name, and he told us how history really happened"; the facts were there [03:33:40], why are these people misinterpreting this history? This is revisionism. And that came from her; can you imagine what Ted Stevens thought.

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So there's -- that was an amazing moment for me and unforgettable actually. So with that said we kind of faced some of these same kinds of criticism. As I said the Manhattan Project was kind of a pivotal point; it was a pivot point in exhibit. We -- the narrative of the exhibit was that scientific research gets folded into American life in the late nineteenth and beginning of the twentieth century, pure science becomes -- it's implied especially in America where we have this implication, sort of emphasis. And that the time you get to World War II you have this big -- the emergence of big science with the Manhattan Project pushing -- pushing all of this. And that really kind of changes the scientific relations of science and scientists to Americans in that period. I think becoming a big science -- just makes science so much more in our lives than it ever was before.

We saw the destructive powers of this but after that we saw how it really changed our lives completely. So that led us to unfold the rest of the exhibit as big science effecting how we as a public viewed science and we called the science in the public eye post World War II, especially with the rise of the environmental movement and so on. But the premise is it's become so important it just can't be put aside in some way in American culture.

Well that was taken very negatively science in the public eye because this was seen by stake holders, particularly scientific stakeholders and I'll just say it, the sponsors for this was the American Chemical Society and that made all the difference on this thing. But they took this as, especially when you talk about environmental things as a big negative and we were really just trying to talk about public consciousness of these things and we probably made some mistakes. But we viewed the Manhattan Project and its aftermath, this legacy in immediate terms. We looked at the -- we had the CP-1 pile, Chicago Pile, we did a diorama in that -- I wish I could show that to you but you can envision that kind of thing.

We kind of carried out that plutonium story forward so we looked at Hanford and we had the B reactor, we had the control panel for the B reactor there. And we talked about the issues of waste and the problems at Hanford. I was working with a colleague who has done a lot of -- did a lot of research in this, his name was Pete [tape went silent at [03:36:28-03:36:36] about the radiation experiments at this time, the undisclosed. [03:36:40] And so we put that into there. We had images of Nagasaki, the images from the air, images from the ground that was a pretty frequent at that time when Enola Gay thing was just happening and we got images from Japan, its peace museum and that in that exhibit.

We were trying to look at -- we just didn't -- we couldn't see how you could talk about the Manhattan Project and not show the bomb. But we took that beyond there -- here's the long legacy of this. We applied some of the lessons in the Manhattan project, science coming into society through the birth control pill; it was one of the case studies we did. We looked at the environmental movement after the war. Rachel Carson was a good piece of that story, GMI got into it. We had -- we applied it to biotechnology after the war so we had video, hand held video from the Cambridge City Council debates at that time provided by a colleague at MIT.

So it was all about how do you make decisions in an uncertain world. And that was really kind of legacies we played it out. And we saw all of this was in seed in the Manhattan Project; it was a very important story. But as I said there was a tremendous potential for misunderstanding of these things, particularly when you've got very involved funders constituencies on this. So you had that sort of conceptual misunderstanding that happens from the beginning. But I think I learned an awfully

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important lesson about the ambiguity of objects and how objects can play in different ways and you just don't anticipate. I'll just take a couple of these to give you an idea how I was surprised whenever a great find for this exhibit was the offering of a fallout shelter -- family fallout shelter, not one of these big buildings. But a family fallout shelter was essentially a big water tank that had been converted and was in Fort Wayne, Indiana. And this fall out shelter came to the museum in 1989, why was it donated in 1989? The Berlin Wall had fallen, this come -- this nice family of Fort Wayne, Indiana said, "Look we don't need this anymore"; boy were they naïve. And the thing was kind of brought into disuse. The water table is such that it kept floating to the surface and they had to keep excavating -- so we did the final excavation and we went out and brought -- I thought "Boy this is a beautiful thing to bring to science and American life". Well that was the lightning rod of the exhibit; that -- that mixing metaphors. It was the lightning rod [03:39:40] -- it was just terrible. But I do not regret the day I put that in and I had to defend that not only to the funders but to the secretary of the Smithsonian called me in, the top guy called me in and said, "Why are you doing this"?

Unidentified male: I don't understand what the objection was.

Art Molella: Well I'm going to tell you.

Unidentified male: Oh God.

Art Molella: The objection was as follows. This was -- we were objecting from the standpoint of both the American Physical Society which ended up getting into this debate for no particular reason -- they had no skin in the game for goodness sakes, no money in it. But the American Chemical Society was this was a -- it's disconcerting what happened. This was a category mistake. This had nothing to do with science; this was a nothing but -- this was something about superstition, public superstition. They said, "You know everybody knows fallout shelters are ineffective". Now they're looking at this as post age property, now it's not -- because it did have some kind of credibility with the atomic bomb. But they said this is shear politics that you're injecting in this -- into this exhibition. You don't have to do this and what this means -- what this does is throw a negative cast on physics in general by relating it to something horrible like the bomb. Okay.

So they said this is a category mistake and -- and they demanded that we remove it from the exhibition. This is in the planning phase by the way, before the exhibit even opened. And I had a supportive secretary and he said, "Go ahead and keep it in". He probably said it's your hide, you worry about it. But we did it and it ended up being a very popular artifact and I think it taught a lot of lessons about this and it really contextualized it. And I'm probably speaking to the converted here but I think it -- maybe not. It contextualized it in very interesting ways and I still love it there.

The other artifact I'll just mention quickly is one that surprised me. And in physics we have the -- we were able to get a donation of a piece of the SSC, the super connecting super collider be put into the exhibit. And this was as -- planning this as of 1991 and the idea was to bring an actual piece of it in there and then parcel it and so forth. So that was all going along fine and then the collider was cancelled because you know; and Hazel O'Leary was then head of the Department of Energy and they then -- they stopped being cooperative. And they said, "You can't show this in the exhibit". Well if you're doing an exhibit or you're doing a play, let's say you're missing Act 2 in a play; this was a big part of the exhibit and it told an important lesson. The lesson was about the sighting of super collider and the science of it was combined kind of thing. [03:42:40].



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And they said, "You cannot have this anymore". "Why couldn't I have it"? "You can't have it because it's a black eye in science of America". I thought it was a great story about one of the losses we had because of this and they just still playing out, but they said it's a black eye and through just - - you know through back doors and so on I got into somebody in Hazel O'Leary's office and we were able to get it donated nevertheless so we didn't have that gap in the show. So that was -- you know this happened. There are no great big gaps in the show but I paid the price afterwards. You want me to hurry up? I'm sorry.

Moderator: Oh no, no, no I'm just making sure that you're being -- you're being recorded and for some reason --

Art Molella: Okay so what I just -- I wanted to close on two things. What would I do different? Because I did learn some lessons from this and I'm not that hard headed I remember some things. You know this was -- I think certainly the first science technology and society exhibit at the Smithsonian and in terms of a global narrative -- I mean an American history narrative -- I think it's one of the first in the nation. At least it's been said that it was that and it was a big risk to the museum. We were used to those -- separating the two sides, the science exhibits and the history exhibits. If you know our museum we have this schizoid kind of thing. But what would I do different? First of all I probably would not have put that Frankenstein image by the genetic engineering. The point of that is we want to show the -- we want to show the power of -- we wanted to show the popular culture view of this before the first clones were made. And here is the kind of horrific kinds of things and you had -- have Jurassic Park. We had these kinds of things before and then we wanted to show the reality, which was actually a much more mundane reality -- we had Stan Cohen's lab in there. It was really very conventional looking. We wanted to show before and after -- Frankenstein had to be part of the front end story of this thing, but the designers wanted to put a full size one -- image of him in there. And that became another very hot spot in the exhibition. I understood that afterwards.

And actually at some later point I took it out -- much later in fact, about three years ago because I understood it was probably making it unnecessary grief in certain ways and you got to be careful about the iconography in this exhibit. It's something that you really have to pay attention to. But I took it out only to get in trouble by fellow curators for when I took that out. The reason I took that out is I said I thought after 12 or 14 years we can do a little experiment. Let's take something out and see if the reception is any different and I took it out. But you know, I would have done is probably not even put it in in the first place. I would do more -- I think there are ways to leaven these kinds of exhibit with things like the wonders of science [03:45:40], nothing wrong with it because I'm -- I am constantly amazed by science. I'm a big reader of cosmology and those areas and I love it.

We did have things in the World's Fair of the 1930's but they are contextualized in that period and we -- and the secretary of the Smithsonian came -- another one came and he says, "Well why did you have to worry the 1939 World's Fair with a discussion of the depression"? And you are purposely -- you are purposely thumbing your nose at science.

So new guy came in and gave me a lot of trouble and he wanted that part actually taken out, the depression. So I'm not taking the depression; that's what it was all about; so that was one thing. With that said I would use -- I guess now I would do something on physicists involved and what's Lawrence Krause and others doing -- using cosmology, using physics, understanding origins of the

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universe. And it's a fascinating story; I'm not viewing this as throwing a bone to anybody on these things. I think it's something that would have may be -- would have improved the exhibit. We could have talked about the imagination more than we did in contemporary terms. I would have enjoyed it more I think and I think it might have deflected some of the criticism.

Just finally I'll end with -- with this exhibit the possible and the post Enola Gay Smithsonian; I would say no. I would not try that exhibit again, at least not in the current form. I don't think it would get past -- for 604 directives saying this has to -- anything like this has to be reviewed to the highest levels. People are routinely doing this with -- I think we would have passed in 1994; we wouldn't have passed today that test. So I think it could have been modified and maybe it could happen. I think science fiction in there would have been great; I've been reading H.G. Wells lately, in there and the very impression about the atomic stuff, wonderful. I think it would have, again, been some kind of leveling but that would have obviously not been the focus—probably we won't do it.

Unidentified male: Art would you have done it again if it weren't in the Smithsonian?

Art Molella: Definitely.

Unidentified male: I don't want to say you can't do the Manhattan Project, but it is a federal exhibit. It's funded federally and it has federal sponsorship.

Moderator: So I guess my question is would you do the Manhattan Project exhibit we've been talking about today?

Unidentified male: Absolutely. But would I do it at the Smithsonian, you're asking me?

Moderator: Yeah, could the Smithsonian --

Art Molella: I tried to do one -- I tried to do this follow-up. What happened was the money just disappeared and I don't have no idea where the money disappeared -- it was internal. I'm not going to think of it in those terms but I think the Smithsonian absolutely has to have an exhibit like that. So would I go down in flames doing it; I don't know. But I think -- I think we do and I'd love to bring -- I'm wondering if we could even bring this exhibit into the Smithsonian. I don't know. I'd love to --

Moderator: It's a secret. [03:48:40].

Unidentified male: I would fight for this at our place.

Unidentified male: Is the current exhibit in American History on war -- American War --

Unidentified male: You mean the price of freedom?

Unidentified male: I mean it's a little --

Unidentified male: Very cursory kind of thing.

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Unidentified male: There's some depressing stuff about Vietnam; is this post Enola Gay?

Unidentified male: That's recent --

Unidentified male: Okay --

Art Molella: That's recent and you don't know how that has been de-natured. Read -- read Scott Boehm's article in the American Quarterly about the exhibit and you'll get a sense because he had kind of a -- B-O-E-H-M. And read mine too, "Call of Stories" by the way on "History and Technology." But Scott Boehm's article just dissects that exhibit. He had some inside view because he had seen some of the planning that had gone on beforehand and it is a -- it is scorned by the curatorial staff in that museum. I'll just tell you that's how it's viewed. And the curator fell on their swords to do that exhibit. And that was an example of exhibit by funder. Is this being recorded?

Unidentified male: Well I think those of us in the room who have directed the exhibit will empathize with the pressures that can be brought from various often totally unexpected external sources. The presentation on the content references that are made within an exhibit and this is something I keep coming back to the marketing of our exhibit. These are things that we do have to be aware of is you can very innocently find yourself in deep, deep, deep, dodo with might otherwise be a very influential sponsor or political advocate by producing something that they are personally or corporately offended by or object to. And I won't use any direct examples but my museums and Alan and Linda you might resonate with this, I have had some very, very surprising experiences when I thought I was representing my institutions admission well. And I found out that I was -- I was in big trouble.

Art Molella: I can't over play the political angle about the criticism because it started really on the internet with a fellow -- a professor -- a physics professor at University of Maryland who has a -- had a blog. It wasn't a blog, but it was on the internet in those days, a newsletter called "What's New" and he --

Unidentified male: Yeah --

Art Molella: And he wrote a very inflammatory thing about the show because he had heard a docent saying, "This is all about science, the God that failed," and that was the headline. And then I just got -- it wasn't just -- it just opened, no criticism at all and then suddenly a bunch of mail came in about nobody had seen. But he had branded it as "The God that failed." And this had to do with the beginnings of the internet too and because this -- this wouldn't have happened before those communications.

Unidentified male: Well I think this is a really important cautionary tale and as -- as our -- got involved in this after the exhibit opened. I wanted to just offer one perspective which I think will help in scaring the be Jesus out of us or in doing a Manhattan Project --

Unidentified male: I didn't mean that to happen.

Unidentified male: I had written a fairly long review for an academic journal of this exhibit and I had not met Art -- so I just went and saw the exhibit as permission to write a review and I liked it very much and I wrote about it and I even made some predictions on what I thought the evaluation

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would show. I predicted that it would show visitors had a higher appreciation for science because the exhibit was actually a little self-critical, which most exhibits of that size are not -- it's celebratory.

And by the way such an evaluation was in fact done about a year later --

Unidentified male: The Smithsonian commissioned it.

Unidentified male: Right. And by two evaluators at the Smithsonian who had no brief for this exhibit but they found could in fact the people who came in were highly positive about science and then left at least as positive as they came in—in contrast to Bob Parks prediction that people would come away feeling that science was horrible and did evil things. So I was then invited back for a meeting between the leadership of the American Physical Society --

Unidentified male: You were there that fateful evening with D.L. what's his -- Bromley.

Unidentified male: And I -- there was one other historian from Berkeley John Halbrether --

Unidentified male: Halbraith.

Unidentified male: The two of us were there to be the neutral parties to try and help smooth the plan. And I realized that our task was totally impossible when a very esteemed physicist and I wouldn't repeat this if I hadn't written it down at the time I was so startled. A very distinguished physicist, I can't remember which one, I think he won a Nobel Prize --

Unidentified male: Bromley -- it was Bromley wasn't it?

Unidentified male: Bromley didn't win the Nobel; no Patel was there.

Unidentified male: It was Patel -- I think it was Patel. Anyway I had notes but he said and I quote, "The purpose of an exhibition about science at the Smithsonian is to [03:54:40] glorify science".

Unidentified male: Yes he did; he did say that.

Unidentified male: If that's your attitude that the only time that -- this was specific to the Smithsonian. I don't think he would have said this about an exhibit at the New York Hall of Science or the California Academy of Science or the Chicago Museum or any other. The notion that the Smithsonian's function is to glorify America and glorify American achievements and in this case glorify science—if you accept that proposition, yes you're going to love every time you try to do anything. And that's why the Enola Gay turned out in the end to be an exhibit about the wonderful job of restoration.

Unidentified male: That's exactly right.

Unidentified male: There was all it was about after the controversy. So I think that should not dissuade us but it might make us want to take some precautions, for example let this be an exhibit of Cynthia's group and not an exhibit of the Parks Service. The Parks Service is a venue for it if you

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will. Just consider that as a way of removing -- I don't know what the public perception of the parks service is. Is the park service only allowed to do things that glorify the topic?

Unidentified female: No.

Unidentified male: They do sometimes --

Unidentified male: I don't think that most people would believe that through the Smithsonian either. They would say the purpose of the Smithsonian is to tell our story, to be America's addict and interpret the obvious in the attic even if they're slave shackles.

Unidentified female: We're not America's attic anymore; don't you know the new brand?

Unidentified male: The amazing --

Unidentified female: Seriously amazing.

Unidentified male: Seriously amazing things in the attic. But my point is that I later wrote several articles about this. It's really a matter of expectations. If you expect an exhibit to be celebratory you're not going to be happy with things that are not. If you expect an exhibit to challenge then you are going to be happy with this one and not happy with the celebratory exhibit. So it's crucial to set the expectations early and then you at least have a firmer ground to say, "Look we told you this is what we were doing". And in fact I think I had done that --

Unidentified male: In contract.

Unidentified male: But it didn't get through clearly.

Unidentified male: You know I would come at that same issue from a slightly different angle though and this may be a bridge too far. But I understand -- I understand what the Smithsonian represents, I also understand where it's located. And I know that you as an institution try not to be captive to your location. But if I have to draw a different analogy, I remember all of the issues that -- that revolved around the establishment of the Holocaust Museum in Washington D.C. and people say [03:57:40] this is a place where we glorify. This is the nation's capital, this is part of the nation's capital; this is where they come for the laudatory experience of America.

Now I realize that the Smithsonian does not have that same obligation. But there is a sentiment here and more broadly the question is if you're going to use a site as a part of your message are you prepared to have critique associated with that site. Now I'm not using the Smithsonian but I'm using Washington as the example, okay? Are you willing to use Los Alamos? Are you willing to use Hanford? Are you willing to use any -- any of these locations to be a hard evaluation that allows people to come away with a critique?

I think it's needed where -- where it exists in some ways will affect that orientation. Washington is obviously the extreme example of it.

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Unidentified female: If where it exists and it's who is behind it following the money; who is supporting it? And with the Smithsonian the idea that it is the nation's museum being critical of something that the nation did is something that's deemed to be anathema.

Unidentified male: And that's unfortunate --

Unidentified female: It is unfortunate but -- but if you've got enough people that agitate and write their congressman and say, "That's not what my good taxpayer money goes for; I need you to get up there and be against that" for whatever your representation is then that's something that comes home to roost. So I think I agree very much with Hamlin. If it can be representative of atomic heritage foundation and not the Smithsonian or some kind of organization that answers in that way it can be a lot more egalitarian in its way, a lot broader in all the interpretation. It's interesting I never really thought about that before but you brought it up Art and Alan, that the Smithsonian in its own way was seen as the corporate museum of the United States. That it's the PR for the United States and it's telling a great story of the United States for the United States. And boy that -- that pissed some people off out there, yeah.

Unidentified male: Art it could have been a lot worse. I remember the -- you had a panel and you invited me, I think Glenn Seaborg and Charlie Weiner to give suggestions on how to do this exhibit. If you even see Glenn Seaborg agreed pretty much with Charlie and if you had done what we suggested you would have really been in trouble. But in terms of venue we did our exhibit in 1995 with the city of Hiroshima and Nagasaki with the Enola Gay exhibit [04:00:41] and you -- a lot of the same artifacts that American university. And what we were planning it initially the president of the university was fairly new and it was a great idea, stand up for academic freedom, intellectual integrity. And then you start to get scared and you figure they're going to protests. You thought there could be fire bombs; he didn't know what was going to happen.

But the Air Force Association and the American Legion who had led the attack on the Enola Gay exhibit did not criticize us. They said that this was fine for private institution.

Unidentified female: There you go.

Unidentified male: Whereas at the Smithsonian at the Air and Space Museum they thought this was the worst --

Unidentified male: Well the Air and Space Museum if you look at the legislation for that I believe it does say explicitly and this came out of Barry Goldwater it was to be celebrating American achievement in air and space. It's right there in the -- could not true for the American history but it was for that --

Unidentified male: Like church and state; science and state. I mean what you're allowed to say on public property.

Unidentified male: The thing is the Smithsonian does have a research tradition behind it and that's why I'm there and that's why value -- you cut up presumed academic freedom, but it's not really true.

Unidentified male: Andrew?

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Unidentified male: Question by Angela, whether there was a taboo on the offensive use of radio isotopes in the war, there are two things. Chadwick in the Liverpool Blitz had a past which allowed him to go to any bomb site. And in fact he used to go with a Geiger counter looking for evidence of what we would now call a dirty bomb. And the other thing I came across and Alex may know about this more than I do is a letter from Oppenheimer in 1943 where he raises the question of poisoning food using radio isotopes and he says, he says to Fermi "This connection I think we should not attempt to plan unless we can poison food sufficient to kill half a million men since there is no doubt that the actual number effected will, because non-uniform distribution the isotope be much smaller than that".

Unidentified female: So that were --

Unidentified male: They were worried about what they would have done if the bomb wasn't possible for some reason. If they could make essentially a dirty bomb; that was the context of that particular --

Unidentified female: I think Barton Bernstein has written on that particular piece and I -- I did find evidence the X 10 reactor was used to make radioactive tantalum and some other materials that were used in tests of radiological warfare after World War II. But I mean early enthusiasm and the possibility of radiological warfare I think died down after Oppenheimer's you know, estimation of how much radioactivity would be required. And then the army pushed it again in the late 1940's, they did some tests and once again it's -- it's just really, really hard to disperse enough radioactivity to do the kind of damage -- I mean in the 40's, so yeah [04:03:40]. So I do have a little bit on that in my book, but I think it was -- so far as I understand this was never very -- you know publically known, although it was certainly discussed by leaders of the Manhattan Project.

Unidentified male: There was concern during the war of Project Peppermint in which they thought that the Germans might rain down radiological dirty bombs on the D-day invasion and many of the invading soldiers had dishonors on them to see if that was the case or not. And Groves pushed that through and got the like and they did all of that and that was Peppermint.

Unidentified male: There was some radiological warfare officers who radiological officers there who were measuring the beaches as a matter of fact --

Unidentified male: To see if the German's were --

Unidentified male: Checking for explosion or something.

Unidentified male: Can I ask Angela a question while we're on the radiological stuff? You mentioned these guys dropping all this like iodine in the lakes and stuff which, you know, to my era sounds like an awfully unregulated way to go about doing ecological experiments. I wonder if you could amplify a little bit about was there much radiation on the civilian side of things versus the military side of things?

Unidentified female: This is a really interesting question and I ended up doing some work on radio isotope -- the regulation of radio isotope use and I had a good conversation with Sam Walker about this as well. So there was not as much regulation as in retrospect we think there should have been

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for a few different reasons. One had to do with the legal forms that were used and that first phase of radio isotopes distribution. The authorization forms basically was—everybody who perceived radio isotopes had to release the government in Monsanto which was the contractor at Oak Ridge from any liability including for human use. And the government felt like this probably would put them in good enough stag because they thought about radio isotopes like drugs. Like in general if a patient suffers the pharmaceutical company is not usually held accountable for miss-dosage effectively. So that was the kind of model and the other thing is that after World War II especially on the medical side the government did not want to be regulating medical practice. So they kept the regulations as minimal as possible. People did have to agree to safe usage but there was not a great deal of enforcement of that in terms of site visits. Although the radio isotope -- the isotope branch did build up a group of people, which over time began to visit more and more of the sites where radio isotopes were used.

What really changed this is the atomic energy act so [04:06:40]; so in 1954 and also the fact that there was this shift to government regulation with what it's called, the APA there's an act that's passed in 1949 to 1950 that requires all federal agencies to codify their regulation and specify how the regulations can be contested in court. And part of the proliferation the federal regulation has to do with the implementation of this little known but very important act. And it's out of this act that is part 20 of CFC comes out. This was the radiological safety part of the atomic energy commission legislation act, the atomic energy act. It doesn't come out though until 1950 -- the '54 act. But the part 20 comes out in '57; it's kind of hung up for a long time.

So by the '60's -- by the late 50's and 60's there is more regulation and oversight; and I argue in my book that this is kind of the leading edge of regulation of researchers in general. One of the interesting things in the very early years of the AEC and this came up yesterday is that the leaders of the AEC realized that if the human experiments with plutonium came out this would really be controversial. And so they chose to keep classified human experiments in which patients often -- cancer patients were unknowingly injected with small amounts of plutonium and other fission projects to see what the metabolism was just because they didn't want to embarrass the government. They didn't want this to be a public problem even though it occurred in the Manhattan district under the AEC. But then they put in place -- I think the first use of informed consent is by the AEC by 1947 they have a provision where all human experiments just involved informed consent. However this regulation they applied to their own contract of research sites. So in Berkeley this would be like USF was doing experiments and some other sites as well, Rochester Medical School was doing a lot of experiments for the AEC. But they did not apply it generally to anybody who bought radio isotopes because that would involve regulation of private medical practice and private science.

So that this line between private and public; I mean many of the experiments that are now most controversial were not done by the government or by the governments contractors but by individual scientists at you know, like at Vanderbilt who gave radio iron to pregnant women and I covered this story in my book. This was not regulated; it had to go through the subcommittee and human application to say this was a legitimate application. But the government didn't have a regulation about exposures because they thought of themselves as just the supplier and not the agent of that exposure. And the other thing that I would really hasten to point out is that most of the uses that I talk about in my book tracer uses involve micro-curial amounts of radio isotopes; they're really, really small amounts. It's when you get to therapeutic applications that you get more to military amounts. And so even the Wisconsin ecologist that's putting some iodine -- radio iodine into the



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lake, these are really small amounts. That said radioactive isotopes [04:09:40] are no longer used as ecological tracers. Now stabilized isotopes are favored for just the reasons you might imagine.

The fact that even in the 60's that this was acceptable tells us something about the kind of difference in public consciousness about radioactivity. I'm sorry for such a long winded answer but you do have this curious situation in the late 1940's where the human experiments that are most regulated are the super-secret military experiments that are done by AC contractors and experiments in the civilian realm are basically not regulated. It's a very ironic consequence of the early decisions that were made.

Unidentified female: I want to go back to something that Alan said a while ago about the difference between the park service and the Smithsonian. And I think there are some differences and I think as a little kid growing up we hear about the Smithsonian; if you don't live on the east coast you want to go visit the Smithsonian because that's where the Star Spangled Banner is and where the Hope Diamond is and so there is sort of this celebratory really cool stuff, really good place to be. The park Service is certainly much more spread out and it's something you kind of have to -- you go to if you want to hear the story. So you go to the Grand Canyon but you also can go to [Inaudible] or you can go to the Rosie the Riveter or you can go to Sand Creek. And so you've got sort of the different broader, lots of different stories. Whereas the Smithsonian really is kind of big America. And I think that would be where the park service can tell a story that the Smithsonian might not be able to.

Unidentified male: That's sad to hear. That's sad to hear that.

Unidentified female: You all may already know this but a friend of mine who is the historian of science sent a message to me about the Manhattan Project's influence on chemistry in connection with rare earth's. That you all know this so I won't bother to read it into the record; yes you all know it?

Unidentified male: No, go ahead.

Unidentified female: Most of the rare earth's were distinguished making production possible as is now necessary for the car, computer and space industries, etc. as a result of Manhattan Project contracts for uranium separation.

Unidentified male: Okay.

Unidentified female: Roy MacLeod, historian of science.

Unidentified male: That makes perfectly good sense.

Unidentified female: All this is now part of the sign of Japanese Cold War in the South China Sea.

Unidentified male: Yeah.

Unidentified female: I thought we talked about biology and ecology; we might -- and physics of course, we could include chemistry absolutely.

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Unidentified male: We did, we did yesterday talk a little bit about uranium as a natural resource and that part of the whole process is the location, [04:12:40] the excavation and separation so it can be performed. And the idea that there can be byproducts of these kinds of geological investigations just makes perfectly good sense.

Unidentified female: Also possible funding sources if you think that lasers, computers, cars are all using these rare earth's which were developed as partly as a result of Manhattan Project research.

Unidentified male: You know there's a minor point to be put in there harkening back to some of the secrecy discussions also are our own understanding of the history of the Manhattan Project has been warped over time by the secrecy in question. And this is not just the fact that we find new things out but one of the -- the people would argue that one of the reasons we have such a physics centered discussion of the Manhattan Project is because the physics is easily declassifiable. The chemistry is not. The metallurgy -- there is many metallurgists at the University of Chicago as there are physicists and chemists, yet have you ever heard of a metallurgist? No because that's plutonium. That's classified stuff. That's how you make an actual core.

Unidentified male: But it came out of the Met Lab.

Unidentified male: But it came out of the met lab, the metallurgical laboratory and all that code name -- there's also engineering too and this is something -- there is a much more inclusive story of the Manhattan Project to be told -- the graduate student wrote about this, Henry Smyth who wrote the Smyth Report. He got letters for his entire life from angry chemists who said, "Why are there no chemists for the atomic bomb"? Well that's because that's classified. And so there's something for us, you know funding sources but also there's huge parts of the Manhattan Project nothing knew with theoretical physics. And in fact arguably the theoretical physics is not the biggest -- it's not the part that actually makes the bomb. It's the part that plans a few things out.

Unidentified male: That's absolutely right. The -- speaking as a physicist -- we have tragically overlooked the contributions I think pretty fairly chemical engineers, the contractors, there's so many other aspects to that story that should not be forgotten.

Unidentified female: And with all due respect to Los Alamos I think Los Alamos gets the Lion's share the credit for -- and so much happened at Oak Ridge and at Hanford that really needs to be part of the consciousness.

Unidentified male: I can't tell you how many times people have referred to Oppenheimer to me as the director of the Manhattan Project. What can I say?

Unidentified male: The fifth floor of the new --

Unidentified female: And then there's the whole story of course -- there's the creating the device which -- the gadget and then there's the weaponization of the device and the delivery of the device, which that's a whole other story and wind over our air force base and everything else that went on. So we haven't talked about that at all.

Unidentified male: Oppenheimer [04:15:40], 30 guys, 30 physicists and Los Alamos and one city, Hiroshima. It's the way it's compressing, isn't it?

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Unidentified female: Yeah, a lot of people think Einstein was involved in the Manhattan Project too.

Kelly Moore: I think I'm supposed to be one of the reflectors and I have that -- you know that same feel when the students are looking at the plaque. I just wanted to say a couple things about it. I think it's often the case to the end of the work shop we -- there are some really critical ideas that just suddenly come up. One of them is the question we haven't answered yet which is the question of what -- what are the scope conditions of the project. So from what point A to what point B where do we want to go? The second set of questions to what extent is the exhibit going to be related to a set of places and I take Angela's last minute comment right here is that too much of the story is Los Alamos centric and too little of the story involves other places including as we talked about yesterday about where does uranium come from? Where do all the things come from that actually make this?

And we also don't have enough of the different kinds of actors. Even if we went with the most conservative version of this which would be just talking about the scientists, certainly they need lots of other scientists involved, their stories and what they did. The other question I'll just say is a response to the question of it should all be glorifying since it's a center only about science. One of the things that Angela's project brought up I think both in your presentation and in here is that the edges of the military and the civilian are not always completely clear. And the roles that people are playing in any given situation and setting are not always completely clear.

I'm aware politically that we don't want to strategies and thinking about how to handle this might be, but it's also true that as something that's supposed to represent many different constituents, some of whom actually didn't have good experiences or were harmful things, etc. that I don't want to make -- I don't want to be that we only go with what a group of scientists and chemists I might add are among the most conservative on a question of their relationship to public life.

To make sure that there are some more varied perspectives given again the political questions and problems of things related to sponsorship? I did not know about the pre-test test; post test, whatever survey thing thanks to the sociologist that that seems like a great idea to do. And we didn't answer the question I think that came up earlier which was who were the constituents that we want to start talking to right now? I say we are not making the museum up or the exhibit but who are the people that we would want to go to immediately and say, "Who are the key people who this thing is not going to work without them"? And making sure that they're on [04:18:40] board. What are their concerns? Bring them in early on.

I'll just say my other final pitch which is that I think it would be challenging to garner enormous amounts of interest in this without asking questions about the consequences of radiation, of weapons, of public life and other things that came after the Manhattan Project proper ended. But again I -- I'm not the -- I don't have the final word on that. But I also -- I took very seriously the question of what these material objects and very different things to different people and choosing them carefully. There are some that are going to be non-controversial and there are others that are going to be very controversial. Even some of the pictures Angela that they could put up here which are true to historical record, I mean I don't know if people are going to love seeing pictures of some of those.

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Unidentified female: I know.

Unidentified female: It may be more judicious, but --

Unidentified male: Just one other thing that came to mind. There's a place somewhere towards the end of this exhibition for some display, it wouldn't have to be large of things that came out of Manhattan Project. I'm thinking of my working with Luis Alvarez and his memoirs. Louis invented exploding wire detonation technology. It was used to give a simultaneous explosion within a millionth of a second of all of the different pieces of the implosion system. Exploding wire technology as I understand it is now the standard way you detonate explosives in industry. So that was a whole new technology that came out of just this one little piece of development. And I'm sure though we know there are lots of others, but if you start exploring where these things went it gets to sound somewhat true that there was a rich fallout across the board of from the Manhattan Project in all sorts of industries.

Unidentified male: But there is a little exhibit at the graphite reactor to the -- to the right of the big panel. There's a small gallery and I can't remember the specifics, but it does have examples of several of the collateral developments in terms of product.

Unidentified male: And I never heard of the rare earth thing at all, but of course boom, rare earths are suddenly terribly important to our technologists today.

Unidentified female: And I would say that's most of the meat of the post Manhattan Project topics at the Bradbury. The high speed photography, imaging technology; yes exploding wires and yes, a high explosives in general.

Unidentified male: Yeah well I was wondering about this charge, was that technology independent of the Manhattan Project, there were shake charged being developed with a Bazooka and so forth. But I just wonder if all that came out too?

Unidentified male: I think there was some nineteenth century American Admiral who came up --

Unidentified male: That's right.

Unidentified female: A lot of associated technologies --

Unidentified male: Yeah.

Unidentified male: But now trying to defend the Rosenberg's saying everybody knew about that.

Unidentified male: Oh, oh, oh. [04:22:06]

### [Presenting the Manhattan Project](#)

Cindy Kelly: We have two assignments for this afternoon. Maybe we take them in reverse order; I do not know whichever order. One is provide recommendations based on our discussions and any further thoughts you have that would be for the field of informal science learning as a whole. What has come from these discussions? You can bring to the table that you may have been holding back

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on us but it is relevant now to try to come up with our concept that Al will say this is wonderful. They are great contributions to the field of informal science learning.

The second piece is what we have been wanting to do for the last two days, which is to help put some parameters on what might be a viable national traveling exhibit on the Manhattan Project... I would like to propose that we not limit ourselves to one concept that we may want to say here are three concepts or whatever seems right because we do a little test marketing. I just wanted to open it up not to say we have to necessarily all come up with THE one thing, but if we happen to come up with THE one thing that is great. However, if there happen to be two competing notions or three or whatever, we can then go do an iteration process and get some more feedback on those three ideas.

Let us see who would like to start. Which one, it is now approaching two o'clock, I would say if we take the broader lessons, does that make sense, take that first or take reverse order?

Unidentified Female: Broader.

Unidentified Female: What is that?

Unidentified Female: I think broader lessons.

Unidentified Female: Broader lessons first, okay. We will give ourselves until two-thirty. How is that to come up with the broad lessons. Doable? Two o'clock [laughter]. I am looking at you Allen and I am sure you have done this a dozen times. Okay he is nodding, two o'clock. Why don't you get us started?

Allen: This is the end of the fun stage of developing an exhibition. Max has done this just as long as I have so he may have some comments as well. We are all fascinated by the discussion we just had, I can fairly say that to everybody. We are surprised to discover a lot of agreement [00:03:00] and we are not terribly surprised but challenged when discovering areas of disagreement. Now we are at that nasty place where we have to actually start talking about stopping talking and coming up with an exhibition.

We are in much better shape than in many topics because we have incredible expertise gathered together. It is not just expertise in having researchers here, but people have actually thought long and hard about what is it important to communicate. When you start working on an exhibit that becomes a big challenge. We can all agree, even a simple topic like I did an exhibit once on biochemistry. We had tons of facts on biochemistry but when it came to deciding which of those things were important to try to communicate we got into major arguments, people did just not agree. The various biochemists and historians of chemistry and chemistry teachers all had very different opinions of what were they essential things to include.

The danger, which is what happens with most K through twelve standards, is that you try to make everybody happy and the standards become a hundred pages long and there are long, long lists of things. If you dare leave out any one of them, an entire community rises up to smite you. I do not from my reading of what has happened in the past couple of days where we actually do not have that much of a problem. The major topics, which you had picked in advance, are the ones everyone feels is important. There was nothing, we sort of dismissed as, well that is an interesting side light, but that is irrelevant to the main story. The problem now will be, backing up, an overall conclusion

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would be that we are much better than average prepared to develop and exhibition. The process that we went through the last day and a half, really turns out to have been a terrific start. I have been doing this for 40 years, I have started many exhibits, had developments in total disarray and disagreement. I think one important thing I talked to Kirsten about the evaluation she is going to be doing and I said one thing would be really to talk to, we have historians here, and we have [00:06:00] some with science backgrounds, some with history backgrounds. We have museum and education people here, we have parks and energy is finding out how many of them have new respect for the other fields. I might actually call up one of the others for some question that they would not have known to do or felt enough confidence and trust to do before this meeting. That is very important for these interdisciplinary meetings where we came together for this one topic and we will probably never talk to each other again. I do not feel that came out of this meeting, I think many of you are doing things I am, and I have made lots of notes, that I want to follow up on because they are going to help me in my work aside from this project.

Okay, any other comments I have would be about the specifics of getting started on the exhibition. I did though want to run one thing by you because part of the challenge of an exhibition is realizing that it is finite.

Unidentified Female: It is what?

Allen: It is finite, finite in size, finite in time, finite in money.

Unidentified Female: Yes.

Allen: I think I said earlier you do not want to start off by saying, there is not very much we can do so let us restrict our conversation, no that is out of bounds. We have had a day and a half of anything goes. Let me just offer two numbers from the great experience of museum exhibits. I will ask you to guess. The first number is, I am sorry, start with an assumption, and the assumption is we are going to do a really exceptionally performing exhibition. One, which in terms of its educational value is in the top ten percent of the nation's exhibitions. We have data. Let us say it is an exhibit of fifteen thousand square feet, that is a major exhibition and too big for many places to take and may not want to do that. What percentage of that exhibit do you think the average visitor will actually visit?

Unidentified Male: That is assuming the visitor enters the exhibit at all.

Allen: Correct, very good, thank you Matt. The status for people who actually enter the exhibit, and this was collected from many different major exhibits, what percentage of the components in that exhibit? I am being sloppy I do not know why. Exhibition is the name for the whole physical things. Exhibit would be a unit, let us say a unit on radioisotopes [00:09:00] or unit on the decision to drop the bomb. What percentage of the units do you think people will visit?

Unidentified Male: Twenty-five?

Unidentified Female: Twenty-five percent?

Unidentified Male: Ten, twenty?

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Unidentified Male: Five.

Allen: Five, wow.

Unidentified Male: I would say forty.

Unidentified Female: Twenty-five.

Allen: You guys are pessimists. For the top performing exhibitions, the top ten percent is fifty percent, so will visit half the units. That is still distressing to many people because half the stuff I worked on nobody is going to see. That is not true; it just means not everyone will see it.

Unidentified Male: How much time do they spend on it? That is crucial.

Allen: Next question.

Unidentified Male: Allen, you said fifteen thousand square feet right,

Allen: Right.

Unidentified Male: That is a huge exhibit.

Allen: It turns out that is pretty much true if it is a five thousand square foot exhibit.

Unidentified Male: I can see fifty percent of five thousand, but fifty percent of fifteen thousand is a different amount of time that you are actually there.

Allen: There is an enormous span. The span goes from zero for the people who do not even go in, to I have never seen an exhibit that actually got one hundred percent.

Unidentified Male: Right.

Allen: Up to the seventy and eighty percent. Yes, you are right for the smaller ones it tends to be higher.

Unidentified Female: What were some of the exhibits that got seventy to eighty percent?

Allen: Let me see if I still have the paper. This is a paper by Beverly Sorrell; called *Paying Attention to Paying Attention* looked at visitor attention to exhibitions. I will see if I can pull that up here. Next question is how much time people will spend. So what do you think the average time in the exhibition is going to be?

Unidentified Female: Again, this is going to a top performing.

Allen: This is a top performing exhibition.

Unidentified Male: No more than an hour.

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Unidentified Female: Two hours.

Allen: An hour, two hours.

Unidentified Male: An hour.

Unidentified Female: Forty-five minutes.

Unidentified Male: Forty-five minutes.

Allen: Forty-five minutes.

Unidentified Female: Two hours.

Allen: Any others?

Unidentified Male: I have seen ten minutes [laughter].

Unidentified Female: Top performing now.

Unidentified Male: Top performing.

Unidentified Female: They have to visit fifty percent.

Unidentified Male: But they have to walk through fifteen thousand square feet.

Unidentified Female: Fifty percent.

Allen: The average again this is averaged over the top performing exhibitions, the average is one hundred minutes.

Unidentified Male: Wow that is great.

Allen: That is the top performing exhibitions. For other exhibitions, it may be much less.

Unidentified Female: I just want to clarify it for Arthur, that the Smithsonian is a special case because a lot of people come here as a once in a lifetime visit to Washington D.C. and they literally put roller skates on to try to see everything in one day.

Unidentified Male: To see hordes going through.

Unidentified Female: That is why the Smithsonian cannot be factored in even though it is a top performing institution. Often they are here to check that box [00:12:00] like Heather was saying, diamond check, flyer check.

Unidentified Female: Where this is hosted is definitely something to consider as far as what visitors, what their agenda is for going to the places in the neighborhood, a place where people have



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a strong tie to the community or is it a must-see type of location like the Smithsonian. That all factors into how the exhibit is going to be used.

Unidentified Female: You are assuming this is a traveling exhibit.

Unidentified Female: Right.

Unidentified Female: Will get parked somewhere, indefinitely?

Unidentified Female: No, no I am saying depending on who hosts it, how it used at that location.

Unidentified Female: I see, I see as it travels around

Unidentified Female: Right.

Unidentified Male: You may have different results if it is a co-sci [00:12:46] in Columbus as you would in Chicago.

Unidentified Female: Right.

Unidentified Female: So Ellen I would think some of those almost one hundred percent visited exhibits from my experience has been when I have gone to a museum of tolerance or a holocaust exhibit because you pretty much feel you are looking at everything. It is there for a reason. It is such a moral obligation and you want to look at every single exhibit that is there. I cannot think of any, unless it is something like King Tut where again it is incredible [00:13:25 to 00:14:30] [no audio].

Allen: Non-interactive but a little goes a long way.

Unidentified Female: I do not like them because I think they are a real representation of anything but sociologically complete.

Allen: My only point here is to encourage us to as we now start to narrow down to be realistic in our expectations. We try to say you have to know this before you can understand this and you have to know that [00:15:00] before you can understand this. We need to expect everyone to spend at least two hours. Then we are setting ourselves up for disappointment when we evaluate it. It does not mean we cannot be ambitious but it does mean we need to think hard about pre-requisites. People have done many things to try to force visitors to go through an exhibition in the right sequence. For example, most visitors if you enter a hall and the exhibit is all around, they turn to the right. However, some do not because there are a lot of people at the right reading the introductory panel so they deliberately turn left to the end of the exhibit because there are fewer people there. Folks have tried to force this by putting in big arrows and even having a guard standing there from going in the wrong way. The way exhibitions are used it is not random but it looks that way often with people just skipping over the part that you know they have to look at first to understand the context of the next.

Unidentified Female: So should you design it so that there is more standalone? The wandering visitor can comprehend Unit A or Unit Z whichever in between?

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Allen: Let others comment. My own preference is yes, that each piece needs, if you just went to this one section you could get a lot out of it, maybe not really as much but you would get some core ideas. Beverly Sorrell whose search I am quoting here also came up with an exhibit-planning concept called The Big Idea. The requirement is that you state the Big Idea of an exhibition, twenty-five words or less, single sentence. Then for each section, you have a Little Big Idea and her argument is that the visitor may never know what your big idea is, but if you do not know, people will wind up with a hodgepodge.

Unidentified Male: Can I ask Cindy something? We are not starting with a blank plate are we? Unless you have had iterations of this exhibition before or do you want to start with a blank plate?

Unidentified Female: This group is a blank slate, sure.

Unidentified Male: Okay we are not working within an existing temp.

Unidentified Female: I am not promising to do exactly.

Unidentified Male: No, no but you have already had several iterations of this.

Unidentified Female: I do not want to impose this.

Unidentified Male: That was my question.

Unidentified Female: I want everybody to think freely. Absolutely.

Unidentified Female: We have done some planning before for an exhibit though.

Unidentified Female: A lot of thought and a lot of people in this room contributed to those thoughts. They were neither funded nor built. I am open, maybe a better mousetrap.

Unidentified Female: I was just thinking about a museum exhibit [00:18:00] that I think, I do not know what the statistics are but I think is always packed, hugely successful. It is the Museum of Science and Industry in Chicago, it is called U! The Experience. I mean I have in my classes self-defined science haters, you send them to the museum, and they find out all kinds of things. They stick their hand in this and do this, they type in data, the interactive part, they really like. One thing I am mindful of is that the emotional tenor of that museum is different than the somber museum that you go to find out about the holocaust for example. This one literally has excitement, movement, energy built into the title with the exclamation point. As I have been thinking about how to represent this I am also thinking about what is the tenor of the exhibit. Is it on an interactive, you push the button. Or are there different parts of it, which are more somber, are there some playful, kind of go shopping and feed your family at the A&P. I do not know what kinds of things are like that or help them solve the problem. That also to me is shaping what I think might be in there, but how it could be approached or what is the orienting emotional tenor of different parts of things. Sadness, sorrow, and excitement I do not know. I am taking lessons from what people said earlier that people like to see the piles and they like to do things. It is also not a super happy story in many ways, obviously to put it in my students terms, not super happy.

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Unidentified Male: I think what goes along with that is the fact that those in the science center field consistently overstate the learning aspect of the experience. I had a wonderful discussion with the new Director of the Liberty Science Center in Jersey City. He recently said I disagree with him on this point, but he said sometimes our science center has been too relevant, we try and take on the most relevant issues. I think you can do a lot with relevant issues, I disagree with him certainly on that basis. He also said we acknowledge that our audience is younger, we are realizing that our audience is younger than we have perhaps perceived. We are going to work down to a younger audience. He does have a younger audience but he is still trying to introduce nuclear energy or issues of this sort. The exercise itself is fun, moving balls back and forth and putting hands on things is all fun, but I defy him to demonstrate that there was actually a learning activity that went on there. Can you keep what we would call the dwell time, can you hold the dwell time [00:21:00] because people like stepping in, stepping out, and putting hands on you can. Let us be sure we do not necessarily equate that with learning because it is not always the case.

Unidentified Female: I think and I do not know if this needs to be decided today, but I feel like it does is where is this going to go? Is it going to go to science centers? Is it going to history museums? Or is it going to both? I get thinking about, based on what Angela is talking about, if it is going to a science museum it needs to talk about how all of these sciences, the engineering, the chemistry, and the physics all came together on the Manhattan Project. And how even if you are physicist you still need to be able to work with the past and those kinds of things. That is much more relevant I think in a science center than it might necessarily be in a history museum.

Unidentified Female: We talked about this before with NEH a couple of years ago, they loved the idea of using history as a platform to teach science. Everybody wants to teach science, lots of money coming in for STEM education. You could also trick the scientists in learning a little history. It really is a deliberate hybrid that will be both. When our prototype, we had the World War II Museum in New Orleans just very enthusiastic about it, as were the exploratory men that science museum in Boston. I mean I did not call anybody who did not want that exhibit, everybody, they wrote letters, obviously was a very loose letter of intent so maybe you can get anybody to write anything. I was impressed. There was a lot of interest and they liked the idea, a science museum primarily but this will be interesting.

Unidentified Male: That is as much a reflection on science center. With all due respect, I know this is a great presentation, but it also says something more about science centers themselves. They are realizing that much more that context is important, that history is important so they embrace this much more readily than one might think. I do not think we have to drill down so deeply into the basic science principles just because it is a science museum. We sell better when we have this kind of activity.

Unidentified Male: One thing that has occurred to me in thinking about what a number of people have just said and this is something I think has come up a few times to us here, but whether a science exhibit and a history context or history context and science context. Also, this question about big ideas, what is going to draw somebody to this exhibit? To me it is a history exhibit, what draws people to the Manhattan Project? Is it because they want to learn about how great engineering is? No, nobody cares about that. [00:24:00] it may be end of World War II that is a big popular thing people are interested in. It may be the decision to use the bomb, which even though historians may or may not be debating it as much it is a big draw still. That is the question I still get asked by lay people when I have dinner with them – so did they have to use the bomb? I get asked that

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question every time. I am sure other people who worked on bombs get that and like what did Werner Heisenberg, you just get the same questions over and over again. If it is scone the one draw that I think, I do not think people really care how a nuclear reactor works. I do not think they really care but they want to know how do you make a bomb because that is the relevant question that people are fascinated by and I get asked this by high school students and college students. How do you make a bomb? There is this forbidden knowledge aspect to it that ties into Iran and things. I just wonder if we would even agree that there are a number of questions that the general public cares about. I have not done any studies or surveys so I do not know what they care about that is my impression. If one of those is the way to pitch the whole thing, because they do not care about Vannevar Bush and James Conant even though I do.

Unidentified Male: I agree but partially take a different approach on that. I think that it has a lot to do with age level obviously. There is an age level that is fascinated with the bomb no matter what. There is a slightly older age level that says why am I paying what I am paying for my energy bill again and why aren't we building more nuclear reactors and what is that debate about? There is that element so I think you can extrapolate, if it is just going to be the nuclear environment you can extrapolate to those areas. Lower than the I want to build a bomb, you are almost into basic science principles and what you can show about basic science principles. What I find interesting in a generational sense however, is if you did an exhibit that had the Manhattan Project and next to it, you did like Liberty Science did on the Twin Towers on what was the actual structure and what happened with the Twin Towers, people would walk right by the Manhattan Project. They are going right to... impact and history, you can debate, but no one is going to debate the extent to which the Manhattan Project was profound in many ways that do not want you walking past it because of the Twin Towers.

Unidentified Female: Because that is relevant to them.

Unidentified Male: Exactly. That is what we are up against here is the relevance question. We are reaching a point where unless you are a historian, the relevance has got to go to a larger message and that larger message I am in the field and it is not that fun [00:27:00]. I mean it is hard to say why is science so important in your life, you have to find all kinds of exciting ways to get people to want to talk about that. If we pulled away from the Manhattan Project, well it is really about science and what it means in your life that is still something we are going to have to sell pretty heavily.

Unidentified Female: You just mentioned it again, the age of the person viewing the exhibit and you mentioned that with Liberty Science Center. We really have not talked about this at all that if it is going to a science center, we are really thinking this is an exhibit that is going to travel to science centers, they generally have a slightly younger demographic in general. Although if we think of it someplace like the National Museum of American History and that general all over, it is still written at a particular level for people to understand. Sometimes that will gear you toward what Kelly was saying so what is the tenor of this exhibit. If it is those kinds of people that are going to be attending in those venues, what do we need to do to make it approachable for those people in those venues. It really comes back to a lot of audience research from the gecko and the decision about where this is going to go to decide some of these things about the exhibit. It is good to talk about all these variations, because that is what is out there but you are going to have to decide on one when you come down to constructing it and designing it.

Unidentified Male: Do you have demographics from your museums?

Unidentified Female: I do.

Unidentified Male: We do certainly, yeah.

Unidentified Female: Sure, and they are around. So deciding on the kinds of venues that they are really going to be marketed to, in addition to what is the size of their traveling exhibit space. To know is it a five thousand or fifteen thousand square foot exhibit that we are thinking about, but also the demographics.

Unidentified Male: The other thing here is I come to back to Allen what is the Big Idea and the Little Big Idea. One way that is approached that does allow you to deal with generations is you will see a lot of times in a museum something like the brain. The Big Idea is the brain and aspects thereof. You might have representations of neurosurgery, advanced representations of neurosurgery on one end and some really basic why you see and why you don't see at the other end which allows you to disburse. But if you do that, the Manhattan Project then becomes a subset of a bigger Big Idea. You accept the fact that there are certain folks, and by the way I had a wonderful discussion with the Director of the California Academy of Sciences one time. I walked through and I said that the level of most of your presentations here is awfully high. I said you do not really capture a lot of young people with this. He said I do not care, [00:30:00]. He said basically I know my audience and I know that I have a discerning interested audience that wants to look at these subjects. If they happen to bring their kids, their kids will see something, the pictures will be interesting to them, some elements will be, but I have accepted already that I cannot satisfy everybody.

Unidentified Female: You have to know your audience. You have to know where it is going.

Unidentified Male: With that being said, Body Worlds is not a kid's exhibit, really.

Unidentified Female: You are right.

Unidentified Male: It is not a seven, eight-year-old exhibit. Science centers all across the country, all across the world have carried that exhibit. Science centers are also trying to reach their own demographic.

Unidentified Male: Forty percent of them target senior citizens.

Unidentified Male: I think that that exhibit that is geared toward a noted demographic could work at a science center. It depends on the science center obviously.

Unidentified Female: And history museums are doing just the opposite. Audiences are fifty plus and we are trying to reach down to kids.

### [Lessons from the Manhattan Project for Science and Society Today](#)

Richard Rhodes: If there were two Big Ideas that pretty much equal weight it seems to me that this whole subject they are human kind discovers and inexhaustible new source of energy. Human kind invents the means of its own destruction. In a sense Los Alamos, I mean the Manhattan Project is a subset of the Big Idea. I do not mean that is the Big Idea that is going to draw a crowd, I just

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mean we are not really talking about doing a historical exhibition on the Manhattan Project I do not think. I think we are talking about this rather larger and deeper and more fundamental thing that changed and it was manifested during this historical period in the Manhattan Project. That explains why you could have some of the science. It explains why you feel the need to go beyond the Second World War.

Unidentified Female: Of course, you know as soon as you put down two, someone wants to add three. I just am mindful that I was thinking also about Angela's presentation again that I keep coming back to because one is that people found this unending source of energy. But it was also something else which had this other value for humans which was diagnostic, medical, health related and other things that were not just about energy.

Unidentified Male: Right.

Unidentified Female: The positive and the negative. I am also mindful too that I do not know if this is true empirically, but so many of these, people are so interested in biology, they are interested in their own body, biological systems.

Unidentified Male: Right, Body Worlds.

Unidentified Female: Right. The physics world is not compelling to people. I mean sometimes it is for kids like how it is a bubble, what does a bubble look like or something. I am also thinking too [00:33:00] about the biological aspects of this. Maybe they could be brought in some way because that is compelling. That may be true about most ages.

Unidentified Female: I was just going to add that the other thing that a lot of people are interested are environmental aspects.

Unidentified Male: Yeah.

Unidentified Female: This is really, really interesting and I think we often think of the Manhattan District and the AEC as the causes of environmental problems rather than being the nurseries of environmental science.

Unidentified Female: Great.

Unidentified Female: I mean part of why I presented the material I did is that I do think there are opportunities to tell new stories about the legacy of the bomb and not just represent the old stories in a different way. I would love to see that happen, but I do not know anything about presenting things.

Unidentified Male: This is making me wonder, is the Manhattan Project as part of this exhibit but it is not THE exhibit. Maybe if we start doing something with our vocabulary like you are suggesting and if we stop doing an exhibit on the THE Manhattan Project. Some of the aspects of the Manhattan Project become illustrative of some bigger ideas that carried out over the second half of the second two-thirds of the Twentieth Century and on into today.

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Unidentified Male: If I were thinking of the entrance to the exhibit, I would have a full-scale replica of Little Boy next to some biological or scanner or CAT scan machine or something. There would be sensitive bodies, the good and the evil, the destructive and the constructive, all of those fundamental Ying-Yang things that are there would be embodied in that machinery.

Unidentified Male: If I could just present a totally heretical notion and just have it thrown out. What about the possibility of what I would call a living exhibit. What I mean by this is I do not know if any of you have seen Lawrence Kraus and Brian Green speak on the art of the universe and the armchair discussion that they do. By the way, for those of you who have seen it, it is all pretty well choreographed although it looks very, very causal. It is fantastic in my opinion, it is fantastic. If you use the backdrop of a science center, or any other museum, and you launch this in a living way. What I am most interested in, what I found most fascinating about what I have heard in these discussions are things that I knew absolutely nothing about according to a science point of view. The idea that this was the origins of what we could call our security state and the beginnings of all kinds of concepts about the way we approach society, the way we look at society, is utterly fascinating to me and probably does not lend itself to anything [00:36:00] you could put into an exhibit. You launch a discussion on the right platform and your leave behinds can be more piecemeal and people might come back and revisit some of those components, somehow or another I think you have to have a living component of this that brings it all together. You have your Manhattan Legacy initiative that travels led by probably the people in this room quite frankly, who helped bring this to life. You do not need actors to do that you need you who know this and bring it to life. Then your leave behind comes from that. I do not know how you would ever convey as much as you all conveyed in a couple of days in an exhibit.

Unidentified Female: There are so many aspects of this, I was just thinking, the thing travels around it is different everywhere. In Arizona, you pull in Lawrence Krause, along with the scientists were cosmic scientists that are looking at gamma rays. I mean there were a lot of them involved with outer space and you could just start with here they are looking in outer space, you could kind of make some connections.

Unidentified Male: Yeah just along those lines, last year in May, actually Dick Rose played Reykjavik—FAS was a co-host at Stanford's Business School, beautiful auditorium, we had pretty good turnout both nights. Right after showing of the play, I chaired a session, one night it was Dick and Phil Tolman and then we had Sid Drell. We had noted playwrights, historians, scientists talking about not just the play but the implications. I really agree with Bud this really has to be living history. You can invite like you are saying, depending on where it goes, you can invite noted scientists, historians, to come in and have a special nights or special events then record them and you can have a leave behind from this. Your exhibit can be construct as you travel. Then at the end of some period of time, after it travels you have a lot of leave behind material that you can combine.

Unidentified Female: Is that anything, let us say you have a great leave behind, some great exciting performance. Would it be big screen? Can you use it again in the museum?

Unidentified Male: Oh yeah it does not have to be a big screen. We do this at a science museum, Minnesota does a great job with little modules, and those modules are placed strategically in various places in the museum. It is almost like you need a break and boom there you are and you are getting a piece of a presentation that is fantastic.

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Unidentified Female: Or it lives online. I mean I would assume that would be a fabulous online consignment for this as well.

Unidentified Male: Right [00:39:00].

Unidentified Female: Maybe this is a new approach to the exhibit. You start with a little thing and then it snowballs around the country. [many speaking].

Unidentified Male: Yeah. My friends and colleagues throughout the country to add to it.

Unidentified Female: Exactly.

Unidentified Male: You can get that little glass cyclotron, it is about this big I think it is at the Smithsonian these days. There was the first cyclotron and then you can go to a bomb.

Unidentified Female: I think if you think in the context of history and science again that Mack and Kelly just gave us the title of the exhibit and that is *The Manhattan Project Legacies – the Positive and the Negative*.

Unidentified Male: Yeah.

Unidentified Male: Or The Atom, Friend or Foe.

Unidentified Female: Yes the atom, positives and negatives and sometimes neutral. [laughter].

Unidentified Male: It is a wrap.

Unidentified Female: I think though depending you might think it is good, bad, or whatever depending on different points of view. I am hard pressed to find any particular outcome that everybody would agree was absolutely horrendous except for some of the medical experiments, which I think people would agree. Mostly everything else you might have people saying it is great that we have a security state, it is great that we have all these weapons hanging around.

Unidentified Male: Absolutely.

Unidentified Male: Get the NRA to sponsor it.

Unidentified Female: Yeah the NRA would be...then there are some things again I think are just a limited number that people would say absolutely horrendous and how could people have done such a thing. In the main, there are things I mean I am thinking again of themes so what are the legacies of it, some of the legacies are lots of weapons, security state, and that can be represented in different ways. Again, I am not sure everybody is super compelled by the security state as much as I am. But there could be other things like that, as legacies and giving people some sense of what it was like to build the thing. What were they trying to do? What was life like there? What problems did they have to solve? Then other things about what happens beyond that. we have this new source of energy, this new source of seeing and visualization, this new thing that people because they are scientists put to all kinds of uses that I mean that before today I did not know about the environmental stuff that Angela talked about. this helps people to see science as something creative,



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people take this stuff and do different things with it. And there are other questions too about who should manage this, what should they do. I do not have great ideas about exactly, but I guess I keep thinking of what are the three themes, the four themes, and the couple of themes that would be put forth about once we get the [00:42:00] things in place.

Unidentified Male: I think one of the things we have not talked too much about, we got in glancingly is the whole drama of this, I am thinking doctor atomic. It is the debates that go on, people like Oppenheimer talking about its technically sweet. There is this aesthetics side versus the... I think the human drama does drive people to these kinds of things. There are lots of stories of tragedy and someone going on on this, the human stories. I think even telling some of Oppenheimer's story in here.

Unidentified Male: I really think I agree. I really think that the exhibit itself much the way one writes history has to be strictly objective. Has to present the facts, the information and then can be surrounded by a number of these conflicts and disagreements and so forth. The fact is the atom good and bad is not what we should be doing, we should be doing the atom. We should be doing, in a way this is a standard story of the introduction of a new technology into the world. It had intended consequences, it had unintended consequences—that is really the basis for Bohr's whole discussion about the whole thing. The unintended consequences he hoped would swamp the intended consequences, which they did in a sense they put it an end to world scale war evidently except for suicidal explosions.

Unidentified Male: It is not a bad title *Unintended Consequences*.

Unidentified Male: Even that is judgmental.

Unidentified Male: It is.

Unidentified Male: In a sense, it implies judgment for the people who would look at it. I just think if we present compellingly these things we have talked about and let the people who are looking at it draw their conclusions as they will, but not to lead them by saying here was a bad thing that happened.

Unidentified Female: Right. What about science as a double-edged sword I mean that is a common way to look at it, but is it really science or is it science and then the humanitarian, the applicators make the sword double-edged. I do not know but it is true.

Unidentified Male: Look everything that can be made into a tool can be made into a weapon.

Unidentified Female: Right.

Unidentified Male: Or I should say tools are weapons and weapons can be tools. You can use a sword to dig and cut an apple out of the tree to feed yourself. I think the thing to do is to talk about the technology of the sword.

Unidentified Male: I worry a little bit when we try to split too carefully science, good/bad. It is just too murky. There is another nuance that I find interesting and the only way I can describe it is discovery with intent. If you ask young people what is discovery they have a sense of at least

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stumble on to things. Sometimes [00:45:00] we stumble onto them because we set out purposely to look for them. People tend to make a sharp distinction between the Einsteins of the world and the Edisons of the world and say they are discoverers and they are inventors. This is bringing it all together much more tightly at purposeful, discovery with intent and where the intentions met or where they ultimately seen in a different light. I think to me it is a little bit more comfortable way of saying science is going to be good under any circumstances; we are not going to not engage in science. The process is a little less clear than we might think.

Unidentified Female: I think that is also good because I think there is a sense of inevitability of history and you might say the science did research. You do not do research knowing the outcome. It was not inevitable this all came together certainly by the time of the end of the war.

Unidentified Male: It seems like a strange discussion to me because we are talking about a project that was designed to build bombs there was not a lot of...

Unidentified Male: To what purpose? To what purpose?

Unidentified Male: To kill as many people as we could.

Unidentified Male: No that was not the purpose.

Unidentified Male: The original assumption was as a deterrent against the German bomb.

Unidentified Male: Exactly.

Unidentified Male: The initial assumption.

Unidentified Male: To end a war.

Unidentified Male: Yeah but in turn...

Unidentified Male: Not to kill a lot of people.

Unidentified Male: But that it turns into something else.

Unidentified Male: Well I do not know if it did or not. The purpose was always to win the war.

Unidentified Male: That was one of the debates that we are having.

Unidentified Male: The intention was not how many people can we kill or we would have used the bomb in a very different way from the way we did use it. It was deliberately designed to reduce the amount of radioactivity produced underground. If we wanted to kill more people we would have dropped it in the dirt.

Unidentified Male: We also wanted to show the effects of the bomb as visually and dramatically.

Unidentified Male: Which Oppenheimer said would just be a big firecracker.

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Unidentified Male: No but Groves in his targeting says explicitly as visually dramatic a display as possible.

Unidentified Male: Sure.

Unidentified Male: Because we are sending a message.

Unidentified Male: What does it have to do with killing? What does that have to do with killing?

Unidentified Male: What does it not have to do with killing?

Unidentified Male: A visual display?

Unidentified Male: To show the power of the bomb as dramatically as possible...

Unidentified Male: To show the power of the bomb why? In order to convince the leadership of Japan to stop fighting.

Unidentified Male: Well we disagree about that. I think it is also to send a powerful message to the Soviet Union.

Unidentified Male: I am sure it was that too. The point is the intent of this weapon was not to see how many people you could kill. The intent of this weapon was to try to end a war where people were being killed. The fact that in order to do that you killed a lot of people unfortunately was part of the story. But that was not the purpose.

Unidentified Male: I know this is the living exhibit, right.

Unidentified Male: If you want to talk about how to kill a lot of people, you have to look at the death camps in Nazi Germany. There the intent [00:48:00] was simply to kill as many Jews as possible and they got quite good at it.

Unidentified Male: I would say let us even take it back further to the other point you were making about the strategic bombing. LeMay said explicitly was the way you end the war...

Unidentified Male: LeMay said.

Unidentified Male: Right, by killing as many people as possible.

Unidentified Male: That was LeMay's intent that was not necessarily.

Unidentified Male: Then it ends.

Unidentified Male: The Manhattan Projects intent or even General Marshalls intent.

Unidentified Male: But the Manhattan Projects intent was not to develop nuclear energy for this peaceful existence.

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Unidentified Male: Well that was actually, as it happened they were working on that too.

Unidentified Male: But that was not the purpose.

Unidentified Male: No, that was not the purpose.

Unidentified Male: The purpose was initially as a deterrent against the German bomb and then after Germany was out of the war, then it is to drop it on Japan and in some people's minds end the war as quickly as possible, in other people's minds to send a message.

Unidentified Male: Both, actually, in all cases, but be that as it may the intent was not just to kill a lot of people but to demonstrate that...

Unidentified Male: But the potential to.

Unidentified Male: Intent was to send a message to the Japanese leadership that their country would be utterly destroyed if they did not surrender. The intent was not to utterly destroy...

Unidentified Male: By killing a lot of people so it is demonstrating the intent, the capacity to kill a lot of people.

Unidentified Female: But the actual ability to kill a lot of people.

Unidentified Male: Except there was a persistent self-deception.

Unidentified Male: Indeed.

Unidentified Male: This was actually suitable to getting state military target.

Unidentified Male: Yes.

Unidentified Male: They blinded themselves.

Unidentified Male: I think quite deliberately. I mean the fact is we already, as I said before settled that debate. We found a rationale based on the fact that we could not hit the broad side of a barn with our bombing in 1943, bombing large areas, which was all we could do. In that sense the atomic bomb, but even that the intent was not just to kill people and burn down cities it was to end the war.

Unidentified Male: Admiral Leahy.

Unidentified Male: Does not qualify, he was not involved.

Unidentified Male: Well he was Truman's personal Chief of Staff.

Unidentified Male: Yeah.

Unidentified Male: And he chaired the meetings and Joint Chiefs of Staff.

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Unidentified Male: Yeah.

Unidentified Male: But he was asked by Daniels who was interviewing him after the war Truman said we were going to use it as a military weapon, he said then we went ahead and killed as many women and children which is what we wanted from the very beginning. That was Leahy's maybe...

Unidentified Male: I do not suppose the fact does not really count.

Unidentified Male: I think it counts. To me the implication gets into something he was suggesting in the beginning and that is one of the outcomes of this was the possibility of ending life on the planet, long-term consequences. I have been to the A-Bomb museum in Hiroshima over twenty times and I would find that time after time I would write one thing down to make sure I did not forget it and that is by 1985 we had developed [00:51:00] the destructive capability equivalent to 1.47 million Hiroshima's bombs. As Stan knows, actually we developed that even earlier. What I would like to stress in this would be from the very beginning we understood that capability existed as when Oppenheimer briefs him on May 31st he says within three years we can have weapons ten to a hundred megatons in destructive capability. Teller was thinking along these lines Truman says it repeatedly that we can end life on the planet. That element I think should be...

Unidentified Male: You know that end life on the planet was an old cliché about nuclear energy. Hitler made a joke about it with Speer when he was talking with him about whether or not they should work on the bomb. It had been a joke all the way back to the first discoveries of radioactivity. Scientists wanted to blow up the world.

Unidentified Male: Yes, we have those novels and...

Unidentified Male: Now of course you are right, they found a way to do something.

Unidentified Male: Yes, way back, but Truman says this on a number of occasions. On some level he understood the process he was beginning and the scientists understood, at least they allowed themselves to think about the process that we were beginning. The implications of that I think are very powerful.

Unidentified Male: This is a question about their sense of control not about their sense of let us build something that will bow up the world. they were not in the business of blowing up the world.

Unidentified Male: No, they did not want to of course.

Unidentified Male: No one was in the business of blowing up the world or we would have blown it up long ago. Everyone saw a different function for this weapon, this energy.

Unidentified Male: That is the interesting thing.

Unidentified Male: Yeah,

Unidentified Male: We would develop something and use it knowing the door we were opening.

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Unidentified Male: We do that all the time. This is a question of unintended consequences.

Unidentified Male: The first time and that is what I think makes this so different from other things that this for the first time gave us the capability to end life on the planet.

Unidentified Male: Indeed.

Unidentified Male: That is I think one of the sub-texts of this has to be that.

Unidentified Male: You remember what I said, mankind invents the means of its own destruction.

Unidentified Male: Yes, I agree.

Unidentified Female: That is why...

Unidentified Male: But that is not the only purpose of this discovery, nor was it the intended use of the weapons.

Unidentified Female: This will not be controversial at all do not worry about it. It would be fair to say that while people were developing a bomb that people quickly recognized and were developing I mean moral weapons. Had not the historians and all the people and I think about taxes but a specific date for something around those issues. It does seem that talking about one bomb and then the quick development of multiple bombs by the U.S. and then the worries and concerns about everybody else should also be part of the story. I still have trouble comprehending how many, what size this was [00:54:00]. I went and looked at your fabulous nightmare-giving site, but nonetheless wonderful. But I still have trouble getting my head around exactly how many of these things are out there and even representing something like that visually. what does this look like. What is the firepower of all this?

Unidentified Male: All that stuff was pre-nuclear winter of course.

Unidentified Female: Yeah.

Unidentified Male: You only need about twenty of these guys and that takes care of all of us, the truth be told.

Unidentified Female: That story can also be told to not just as the apocalyptic nightmare that nobody wants to look at because we also know the story...

Unidentified Male: Let me come back just one fact to throw into this discussion, which I think is very important. When Oppenheimer went around to the universities to collect the people to take to Los Alamos, he was not allowed to tell them what the purpose of this was. He had to think of some other way to explain to them why they should give up their jobs and go to this weird place. What he told them was – I cannot tell you what this work is, but it will probably end this war and it may end all wars. Now that was too optimistic, it did not end all wars, it certainly had its effect on large-scale war, and I do not think anyone would disagree with that. He did not go into this business, none

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of these guys went into this business with the possible exception of Curtis LeMay hoping he could kill a lot of people. I agree with you about LeMay that was his plan, no question.

Unidentified Male: These questions we are still struggling with today, why shouldn't this be part of the exhibition? Look at how the conversation is gravitate to that. It could be an argument for arms control, it could have that kind of...

Unidentified Male: It could also be an argument about using drones. That is what I am dealing with today.

Unidentified Male: It seems like such a center of gravity this exhibit. It is right on the table today, just like information all day, the arms race.

Unidentified Male: The whole thing about our being terrified that Iran might have a bomb.

Unidentified Male: Why not take advantage of the natural.

Unidentified Female: Okay so we have one conversation the transcriber really cannot.

Unidentified Female: Were you trying to say something earlier Alan?

### [Exhibiting the Manhattan Project: Presentation Strategies and Objectives - Part I](#)

Alan: Yeah I was actually going back to about ten minutes ago when Richard proposed that we should think of this, our project to do an objective exhibit. I want to be very careful here because I have gotten into trouble making that claim. The very fact that we are talking about an exhibit about the Manhattan project is a non-objective decision. We have decided this is important, we could have done something on the Hoover Dam, we could have done something on the Salk Polio Vaccine, and we could have done something on the gas chambers in Germany. We could have done a lot of things. We are already [00:57:00] making a decision based on our feeling informed by a lot of objective data. We are choosing doing an exhibit on the topic, we are going to have to choose to do certain aspects of the topic because we cannot do it all. These will not really be objective decisions. They will be decisions based on a consensus, on argument, on persuasion to some extent on budget and size and time. You put yourself in grave danger when you claim pure objectivity because people do not like what you have done it will be very easy for them to show that you cannot mathematically prove that the content is okay. The way I have tried to work around this and exhibits in the past, the most controversial one I ever did was quite an early exhibit called *What About AIDS*. I had members of my own staff resign. We were going to talk about anal sex in the exhibit in the science center. I will not tell you all the horror stories, in the end the consortia took eight museums working together so we could divvy up the blame. It was I think a marvelously successful exhibit. There was an editorial in the newspaper that said this exhibit has saved thousands of lives. But we took a risk, how did we spread it around? we said we are going to tell a story.

Unidentified Male: Spread it around [laughter].

Unidentified Male: Spread around the risk of doing an exhibit on the topic. First, I said we have a story here, we are going to tell a piece of the whole story. We are going to talk about the human immune system. We are going to talk about what attacks the human immune system. We are going

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to talk about vectors of transmission, of things that attack the human immune system and we are going to talk about some of the ways, which do and do not work to stop the vector of transmission. I think though that is the only in the long run practical way to do this. We are going to tell a story, we have chosen to tell a story about the bomb. Now there are several different versions of the story. One can be these people got together in the midst of war to do something to help their side. Here were the reasons they did it. here is what fed into it, their fears of, their dreams of, their convenience, their desire for glory, whatever the reasons we want to give. Then we can talk about when they were done [01:00:00] what happened. What were some of the both intended and unintended topic. You can see the Manhattan Project story in the middle, with things feeding into it, things going out of it. That is a scenario where I am.

Unidentified Male: That is what I mean by objective that is historian subjection.

Unidentified Male: There are two elements of that that I find very interesting and I do not know if I can draw this, I do not know the history well enough but in the same fashion that you talk about Oppenheimer going out and getting individuals and bringing them in, there is a physical notion of that. you can almost have an exhibit around bringing in people in the same way you are bringing in perspectives. What did I go out and get you for? What perspective was I bringing in to this? What happened to those who came in and what happened to the perspectives that came in. You can have them in and out flow sort of thing. I want to make only one caveat relative to the example you gave. If I am walking into a museum and I see an exhibit that says what about AIDS. I have no idea that you are going to talk about vectors. I have no idea you are going to talk about transmissions. I will go over to it because it is topic, I know about it, it is relevant, and it is in today's world. Will I do the same thing with something that says Manhattan Project? We have to get them walking in that direction. The *What About AIDS* was enough to get them walking. Once you got them there your vectors, but the Manhattan Project is not going to get them there.

Unidentified Male: That is funny I would have thought it would.

Unidentified Male: You and I might.

Unidentified Male: This we need some front-end evaluation here.

Unidentified Male: Maybe ask some question working off Allen's *What Was AIDS – Why Was the Bomb Built? Why Was the Bomb Developed? Maybe Why The Bomb*.

Unidentified Female: The Birth of the Bomb.

Unidentified Male: The Birth of the Bomb, something like the bomb and people know what you are talking about.

Unidentified Male: You look at the whole thing and just Fat Man / Little Boy.

Unidentified Male: Oppenheimer grows [many talking and laughing].

Unidentified Female: Talk about how many chocolate bars they bring in every day.

Unidentified Female: Seriously amazing. Something that has to give that...



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Unidentified Male: The bomb has to be in the title I think.

Unidentified Female: I have no idea what the title is.

Unidentified Male: You – The Bomb [laughter].

Unidentified Male: Would You Have Dropped the Bomb? What is the Meaning of the Word Bomb? [many speaking] [01:03:00].

Unidentified Male: That is really cool it is the bomb [many speaking].

Unidentified Male: The A-Bomb would be atomic bomb.

Unidentified Female: Yeah I think so.

Unidentified Male: A term of approval.

Unidentified Male: What they will say is wow this exhibit is the bomb and they will all think exactly.

Unidentified Male: Very original.

Unidentified Male: Again and again, I get that about the blog also [many speaking].

Unidentified Female: You think The Bomb is not going to work.

Unidentified Male: I am not saying one word. I am saying it will work, it does not matter, and there will be jokes about it no matter what.

Unidentified Female: I think the social meaning of The Bomb to us has a particular, invokes all kinds of associations and thoughts that have no meaning to people born after 1980 or something. They just do not.

Unidentified Male: They have a different meaning.

Unidentified Male: Iran gets the bomb. That is a statement that a high-schooler will understand. They will know what that is about.

Unidentified Female: North Korea had a bomb test. We know what that means.

Unidentified Male: That is true it has a higher recognition than Manhattan Project.

Unidentified Male: For the purposes of this discussion, though there are a ton of marketing folks out there that are going to get us the title we need. It is content and design that we need to know.

Unidentified Male: We do not have to worry about the title, you can survey that one.

Unidentified Male: We are trying to get to the concept through the title in some ways.

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Unidentified Female: People have mentioned the secret self, maybe there has to be some sort of secret.

Unidentified Male: Secret of the bomb.

Unidentified Female: Secret of the bomb, bomb secrets or I do not know.

Unidentified Male: Again I think there are a lot of people who if you put this exhibit is the secret of the bomb or something people feel really excited about it even though you can look it up on Wikipedia. It is still a draw.

Unidentified Female: We will get a title.

Unidentified Male: Wikipedia.

Unidentified Male: If you want to scale this down from the gigantic Hindenburg like structure that we have assembled over the last two days [laughing], are we really talking about the scientific discoveries, the important ones that preceded it, the Manhattan Project. Then I think we agreed somewhere around 1950, which would be before the hydrogen bomb, or maybe we stop with the hydrogen bomb I do not know. I think that is another total can of worms separate from atomic bombs and the discovery of fusion. I mean the Manhattan Project in the middle, the end of the Second World War and then the beginnings of proliferation that is an exhibit.

Unidentified Female: Then [01:06:00] the epilogue meaning what Allen suggested.

Unidentified Male: Yeah the low poster on the way out.

Unidentified Male: I think we have all this if we are going to try to put this in a science center then we have all the science collateral that comes from this. Everything that we talked about in the way of biomedical and environmental and energy. That is a whole other stand that has to be there.

Unidentified Male: I agree. That does not have to be the center of the exhibit that is one as you exit look at all this. There ought to be another hallway that is lined with the countries that have nuclear weapons.

Unidentified Male: I am seeing about a six piece or seven piece Venn diagram with the bomb in the middle and all of these other things that are going to give us our context and consequence.

Unidentified Male: Really, when you define it this way you find that you do not have to have to follow this line to this exhibit, you can do the Manhattan Project part and if you get curious about how bombs work, you can go back to the physics part. If you are just walking through the outcome part you can think well where did this all start and go back. It suddenly does not have to be so linear.

Unidentified Male: That is why I am drawing the Venn diagram in my mind is I have a center with two; four; six; eight however many there are appendages coming off it, each of which though is intimately connected with the center.

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Unidentified Male: Yeah.

Unidentified Female: I think because you are seeing slightly different things. You are saying if we are going to have bomb in the middle, we also need to understand things about people, about place or about other kinds of things as this thing is being made. I think that is a different conception than saying let us look at the physics and the science of it and then the poster on the way out is what difference does it make. I think one of the things that is interesting about it is to think about very different ways of thinking about the bomb or making of the bomb that are not the traditional ways of thinking about it. That includes something other than Alex's fabulous point, which is about the physicist because we do not have lots of information about everybody else. We do not have as much built in either about these people as human beings who were recruited to do something that they did not really know what the outcome would be. But immediately upon the bomb being set off, people had different ideas about what to do and how to act.

Unidentified Male: You want to do a Hindenburg again?

Unidentified Female: I do not want to do a Hindenburg, what I am saying is that if you are going to tell, you can put the material object in the middle. If we ask the question about how does that object even come to be, we can tell one story which is a straight up the physicists, had to solve some problems, they had some engineers with them, here they were, okay. Then oh my goodness what should we do, done. I think there is another way of conceptualizing this which [01:09:00] is even if you took this actual phone and said what are the inputs to it, it is not the Hindenburg. Let us say there are five things you want to say as contributing things, you could tell a story of its making that is different than just the physicists. You can tell a story that has to do with a place, with other kinds of things that feed into its making. The old story does not seem as compelling because we have versions of it all over.

Unidentified Male: There is a way, I sort of look at the Venn diagram aspect. If the only issue you want to come out of this is simply, and I think this is where I am, that wow the Manhattan Project was unbelievably complex. Complex in its design, complex in its outcomes, maybe that is all you are trying to say is the Manhattan projects is really complex. Here is where I would do something different than what you see in other exhibits. We do the same thing with the brain, we say wow the brain is an amazing thing. You have this thing about the brain in the center and then you have disjointed aspects having to do with the brain going a lot of different. Now that is not a Venn diagram. If the bomb is in the center and one element that relates to that is the physical design, the people involved should also overlap with that to some degree. The outcome should also, so that what you are thinking is for the person who made the decision to be part of that design, how much were they even considering what is over here about the implications of it. How much could they have foreseen. The inter-linkages of the part that is connected to the center is equally important. You can go in and look and study the people, study the design or study the medical and other uses afterwards, but you need to see that they are interconnected. So many of our exhibits do not do that, they just say it is all about that topic in the center, then you wander in unrelated disconnected ways to things that you only know it is connected to center, beyond that you do not care that it is interconnected.

Unidentified Male: What this model is also giving to me is a place where we can bridge science and history in ways that are going to be comfortable for both kinds of institutions. Instead of having

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to go from science to history, we are putting them together in ways that they really are and the relationships that Bud is talking about are I think the kinds of things we are talking about for the last two days. A lot of us have been oh my gosh I would never think of it that way and here we have a chance to do this in a physical layout.

Unidentified Male: We talked [01:12:00] a lot about outcomes in the beginning. I think that this was a complex project is not enough. This is the Atomic Heritage Society and the outcome should be a sense of what this heritage is.

Unidentified Male: I think that is a fair statement.

Unidentified Male: Just like the race, exhibit was not intended to just say boy race is complicated [laughter].

Unidentified Female: Right. The way that is constructed allows for that complexity that is in there and encourages people to see those complexities and those intertwined places of who the person was and what they brought to the project. Then what that outcome was or the people at Hanford that were looking at affluent early on and what they were finding and bringing all that in and allowing that to all coexist among this Venn diagram. I like the idea of the Venn.

Unidentified Male: It gives the individual visitors the opportunity to do the exhibit the way is comfortable or the way that is provocative to them rather than forcing them into a linear presentation.

Unidentified Female: Right.

Unidentified Male: We are able to not get tangled up in the chronology. The chronology will be there but it will not be the operational structure of the experience.

Unidentified Female: We actually allow free choice learning. What a concept? That is what we are supposed to do.

Unidentified Female: I was thinking that it might be useful to explain where I am coming from because it might not be entirely clear to people why I am advocating a particular thing. I work in addition to sociology and doing historical work, part of my world is a subfield called Science and Technology Studies which is a discipline that investigates the co-constitution of scientific, technological and social things. It is not the post-modernist version of things that was in the early 1990s. For the people who are part of this association, which I think now, has seven thousand members around the world, the issue for any technological object is to see how these things come into being. Creating a new object, creates new kinds of social relationships. For any object to be created, there have to be new social relationships that exist or are activated in some way. In that way the question about the Venn diagram becomes especially relevant because it is the overlaps in those worlds.

Unidentified Female: Absolutely.

Unidentified Female: That are so critical to getting a story told, not a story, but different parts of this to be understood in a particular way. Again, I am so excited about the new things here, the new

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things that have not been told by other exhibits in other ways. I really think that is a huge leverage point for this exhibit. It is not going to be exactly the same as everything else, just the physics or [01:15:00] just that some people worried ahead of time what would happen. It is going to be something that tells not a complex story but something in the middle and whatever our five things are around it.

Unidentified Male: Those five things are not disconnected from each other.

Unidentified Female: That is right.

Unidentified Male: That is the point.

Unidentified Female: Exactly they inform each other.

Unidentified Male: ...implosion.

Unidentified Male: Go to my exhibit design [laughter and many speaking].

Unidentified Male: Today we are dealing with trying to get rid of these damn things. I know not everyone is but our President officially is working that direction. So in many ways is the rest of the world. Everyone except the United States and North Korea signing the Test Ban Treaty or in our case approving it in Congress. Do we come around to that as part of the end of the story? It is a very important part and even in terms of the history of technology, how do you get rid of a technology once you have it.

Unidentified Male: It is part of the original debate about the bomb too.

Unidentified Male: That was from the very beginning, the question. It connects it in both directions, something has to be there.

Unidentified Female: Being very crass about it, to be mercenary this is a very good talk for foundation money. I have discovered when you approach people like PEW Charitable Trust or Carnegie or you name it they are into peace, peace initiatives.

Unidentified Male: A lot of money for this kind of stuff.

Unidentified Female: There is a lot of money, right.

Unidentified Male: If you only had a graph like the Japanese artist's graph of nuclear tests but in this case showing ratifications of the Nuclear Test Ban Treaty that would be, I mean bing, bing, bing. It would be a very interesting display.

Unidentified Male: Usually let us say giving up, they are all being replaced, by something better.

Unidentified Male: That is what is happening in a way by specific targeting rather than general targeting that is the change that is coming.

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Unidentified Male: Let me ask a question. I am still working about two sentences behind folks. There is a lot of money for this. For those who are giving the money, do you mean there is a lot of money that would find its way toward exhibits. If someone sees that they are willing to invest money what platform do they see this going, the funders, see this going to? I can tell you right now that as relevant as what we described is to the science center community, I think if I sent out a message right now saying we are [01:18:00] going to do a science center exhibition on peace, the creative ones will get it. they will definitely will get it and because they are naturally creative they will find ways to connect to it, but it will not be a natural for them phrased in that way.

Unidentified Female: No, you do not call it that.

Unidentified Male: I know you do not obviously because then you will not get them connected.

Unidentified Female: It is in technology and future of nuclear weapons.

Unidentified Male: We are saying there is a community out there that sees this as fertile ground to make an investment and they see that it should be on platforms like...

Unidentified Male: Well we do not know about the platform part but the rest is true.

Unidentified Male: That is what I am going to, there were a lot of foundations out there at the moment and within the last three of four years who have been putting a lot of money into disarmament stuff. There have been movies, they have been funding lots of scholars and places like the Kennedy school. They are not popularized.

Unidentified Male: They can afford to hire people who are historians who do not actually do anything towards getting the world getting rid of their weapons along with what policy. It is actually very flush in terms of an area of... And I do not know if they have ever done a museum exhibit but it is not at all beyond the scope that if you went to them and said look we can do this, we have an online component t would be great a million people would write to the President and say ban the bomb. I mean there is money for it. I do not think it is going to happen.

Unidentified Male: McArthur has been interested in digital and second life and so forth.

Unidentified Male: When we get funded for the digital work and that sort of thing, what is interesting is that the case we would want to make to them is on popularizing the issue, not necessarily studying it in greater detail, but popularizing it. Therefore the methods that we are discussing right now become really, really important almost more than the message. Everybody understands that it is an important message and maybe we can even study it more and that can be done. But popularizing it, it is where all the danger zones are.

Unidentified Male: Even here, I think what we are talking about is if I may call it objective for this historical objective. The question really is when you have a technology that has its good side and its baleful side, how do you bring the baleful side under control. This is a small-scale version of the problem of global warming where the whole human world is the technology and is producing this baleful effect that we are not happy about and we are trying to figure out how to deal with it. The bomb is a very similar problem I will not say smaller scale but more manageable scale perhaps since there are fewer bombs in the world scale industry. You can deal with that in the context of

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everything else that we have been talking about without feeling that you are just pandering to a peace foundation.

Unidentified Female: But if you bring in that component, which I thoroughly think is necessary and you can [01:21:00] tap into the kinds of funders that I think would like that and showing that is going to go into science centers, you have completed a huge equation there. I mean science centers would be an incredible venue for this kind of exhibit.

Unidentified Male: In particular because of their perceived objectivity and in relevance and objectivity.

Unidentified Female: An audience that is going to go there, that already goes to science centers.

Unidentified Male: Point taken. We use this number ninety two million visitors and people say wow that is a lot. In fact, in the grand scheme of things, the world population is not necessarily large but what is important about it is that those are individuals who have chosen to take a portion of their day or their time or whatever to go explore science. So you have them. That is a captive audience for those purposes.

Unidentified Female: Yeah.

Unidentified Male: There is a sociological article that went around a few years ago. It is just a very provocative title I just thought I would put it out there it is called part of the subtitle is: *The Uninvention of Nuclear Weapons*.

Unidentified Female: Donald McKenzie.

Unidentified Male: Yeah.

Unidentified Female: He is asking the question – is it possible to get rid of them. One question he asks is even if you got rid of the components of it how do you get rid of the knowledge?

Unidentified Male: You do not. You have to keep the knowledge.

Unidentified Female: My point was wait until climate change gets us then the knowledge will disappear.

Unidentified Male: Disappear [laughter].

Unidentified Male: My only reason for bringing the title of it is half of the topic of the Manhattan Project is about invention so there is actually time with that theme is actually fun. The story of uninvention is also the story of the invention.

Unidentified Female: If you take the Manhattan Project and you go in this direction do you need to mean to get into what is going on now with stockpile stewardship and talk about those sorts of things as well as the other legacies?

Unidentified Female: If you want funding from the lab, yes [laughter].

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Unidentified Female: It is part of disarmament so it is part of how disarmament is going to happen I would not advocate going to a huge discussion of it.

Unidentified Male: I find this really uninteresting though from a museum standpoint.

Unidentified Female: Which point?

Unidentified Male: The disarmament. There is really very little there, well there is actually quite a lot.

Unidentified Male: No, no physically.

Unidentified Male: The technology for example, we now have systems around the world that can detect fifty pounds of high explosives under water, anywhere on earth.

Unidentified Male: I had a room full of instruments and I go and I read the story, this instrument.

Unidentified Male: I mean the effect is it is as new as the North Korean test of twenty-four hours ago and how we know that. I do not mean that it should be a large part of the display I just think at some point at the end you might want to talk about okay we got this thing, what are we going to do about that and here are some of the few things people are thinking about. or really I would be happy to show the testing graph next to the ratification [01:24:00] graph.

Unidentified Male: Obama's quote from his speeches and a couple of little things on the way out as part of the epilogues.

Unidentified Male: It is funny, for a small...

Unidentified Male: Again, here is how it began and here is what we want to do.

Unidentified Male: No, no not at all [many speaking].

Unidentified Male: You still have to be making the bomb.

Unidentified Male: Sure I think everybody at the same time you do not want to yuck them out in the exhibit.

Unidentified Male: What are you talking about, getting rid of the waste?

Unidentified Male: He means you do not want something that is a two policy decisions from now is no longer....

Unidentified Male: I think you have to stay general.

Unidentified Male: Very general.



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Unidentified Male: The other thing is how much I keep coming back to the threat, public balance and there is an old expression nobody wants to take the kids to the science museum on Saturday morning to hear about cancer. Yet we do have ways of coming at these issues. NOAA provides a great exhibit that many of our science centers use called Science on a Sphere and you can look at meteorological conditions around the world. I am just picturing having exactly that same thing with your model on it. If you come up and look at the globe and say let us say I am going to blow up New York it will be this size bomb. The question is how much of this do you want? How threatening, how much is danger and threat a portion of this? We know it inspires interest. Is that what we are using as the angle here?

Unidentified Male: Part of it.

Unidentified Male: Is it? I guess it is the same thing with AIDS I mean we are using the threat as the hook.

Unidentified Female: But with AIDS, when he did that it was like public consciousness incredibly threatening. The bomb like we just said is not so much that in the public conscious.

Unidentified Male: What I am saying is how would you cultivate that?

Unidentified Female: I think *Wired* Magazines national security section is called *The Danger Room*. I mean people are attracted to titles and things like that.

Unidentified Male: You have to have a button you can push to blow things up or the kids will not come.

### [Exhibiting the Manhattan Project: Presentation Strategies and Objectives - Part II](#)

J. Newlin: We really have not talked about audience though. We said science centers I mean that is what it sounds like that we said and we know we want both history and science in it together as a unit. Even in science centers exhibits come that attract vastly different audiences.

Unidentified Male: We just had something on pirates. It attracts kids of a certain age and their parents have to go. You have something like Dead Sea Scrolls or something like at the other end, which is really incredibly boring to kids. Where do we want this to be?

Unidentified Male: I am curious did your museum carry the Einstein Exhibit at the Field Museum [01:27:00]? No.

Unidentified Male: I saw it in New York.

Unidentified Male: Then there was another one, George Washington Carter. I am thinking of exhibits that do this history/science, those were the two that I am aware of.

Unidentified Male: Da Vinci is a big one.

Unidentified Male: The Darwin one too.

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Unidentified Male: Darwin yes.

Unidentified Female: You had a question and the answer is? Does anybody before you ask the next question is there any answer to this first question?

Unidentified Male: I was just going to say the fact that these weapons are destructive would just be part of the story. That is after all what they are, you would have to show that subtext, and I would assume that would produce a certain amount of understandable fear on the part of the people who are looking at the display.

Unidentified Female: We went to a display of the Denver Museum of Natural History several years ago and it was a computer display where you could change the size of the asteroid that was heading towards earth. My son blew up the earth so many times. When you see the pictures of Hiroshima that are not sanitized that had the bodies it is not so much fun anymore.

Unidentified Male: Did you hear about the meteor that hit Russia?

Unidentified Female: yeah.

Unidentified Male: And you have a problem with showing those images of course. I am sure the exhibit should but that is a tough one. People do not like to see those.

Unidentified Female: Yeah and that goes back to the whole Enola Gay thing. One of the big things was that the objects from Hiroshima that were being displayed—a lunch box, a watch, a dead body—those are very emotional.

Unidentified Male: A tricycle.

Unidentified Female: Yeah a tricycle, an airplane not so emotional. Your good guy story does not have that same emotional tie to it that your bad guy story has. It brings us back to some of our other discussions how do we display that? Again too audiences your science center audiences are going to be your younger audiences, your history museum audiences are older. If you are doing this exhibit, how do you get both?

Unidentified Male: There is another way that you sometimes get at that though and that is that you have the character, you have a fictitious or real character at each age group in the exhibit. Your exhibit is the Manhattan Project and you have young researcher, you have child. The person coming in at the exhibit just gravitates to that age group and you are describing the situations of various contexts from the vantage point of that individual and their age in that group. You can pull them in, you can give each one a place so to speak. The problem is how do you balance the emotions because some are more informed than others [01:30:00] those that are less informed might have emotion, the child is caught up in it. The researcher becomes a provocateur and how you chose that individual is a little tricky sometimes.

Unidentified Male: You know I really think it would help detox all of this if we thought of this in terms of technology and not bombs. I do not mean the exhibit does not have to deal with bombs but I could make the same case about the introduction of coal into the world. There were wonderful

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changes that came to the world including the industrial revolution and untold millions have died of lung diseases and bad coal mining practices and so forth.

Unidentified Male: We did make the decision to mine coal so that we could stop a war.

Unidentified Male: That is not as obviously to be sure. But the whole British Empire thing grew out of their having gotten into the industrial revolution a little earlier than everybody else.

Unidentified Female: It was not as destructive to start with in so far as its original, coal mining what it was used for was to build industry.

Unidentified Male: I grant you it is a little bit more indirect. But the point is technologies are always two-edged swords.

Unidentified Female: Some are more oriented toward one thing than another. We could use a hammer for multiple things but its original purpose hitting nails. I think part of the story of this technology is that it had a particular reason for coming into being at a particular moment.

Unidentified Male: I think that is why it feels so toxic when we talk about it because of its unusual birth circumstances.

Unidentified Male: Once you take that out and you have to go with it I do not think you can detoxify.

Unidentified Male: Just as we talk about it, this new technology is discovered, it has developed, it has expanded and now it has reached the point that we think it is maybe too much and we would like to scale it back. That is the story.

Unidentified Male: It is a funny thing, you would never get away with doing this but it is almost like you want to give an exhibit that says could you build the bomb, would you build the bomb. They could you part you go, the people that get on your site, the first thing they want to know is how do I build one. So you do not quite do that, but you show historically that you can. Then you have another element which is would you and under what circumstances would you build it, use it, whatever. The could you and would you really is kind of the combination of what we are dealing with here. Then there are obviously byproducts that come from that.

Unidentified Female: Right and that is a way to get people into it, it is actually not a bad idea. I mean if we have been talking about being provocative and challenging people so could you? Yeah you can here is the science behind it, blah, blah, blah. Would you knowing that you are going to have biological outcomes that you are going to have environmental outcomes.

Unidentified Male: I think your point is that they could you [01:33:00] is actually a history lesson it is not a cookbook. The could, you might bet you through the door but once they get in there they are going to be disappointed that they cannot build a bomb when they come out the other end.

Unidentified Female: What do the makers face? Could you bring this internationally? You could say these countries and you have pictures of the leaders speaking and saying we have renounced this we are not going to do this anymore and put different people's perspectives. I do not know if

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you can get somebody from Israel to talk about it, but you can bring it to say, people warn me not to get too close to the present. There are different considerations and that would bring it up to today's news.

Unidentified Male: One of the things I think you will learn if you do the could you / would you approach is the one thing you will learn is from a science point of view is that the could you is actually a lot more technically, deeper issue even technically than people think.

Unidentified Male: Absolutely.

Unidentified Male: I keep going back to what somebody said the secrets of the bomb. I think first of all the secrets of King Tut whatever it has that attraction. If you think about it secrecy is so built in to this whole thing from the birth of the bomb, unleashing the secrets of the atom if you want to see that, but then the way Los Alamos and other places were done. Then the whole proliferation thing, all in secrecy, it is all about secrets. It seems to me that is just a nice general theme for this plus it has a secret in the title.

Unidentified Male: Even though the common phrase unlocking the secrets of nature, the form of discovery.

Unidentified Male: The disarmament as part of that, you are trying to detect all these kinds of things that are happening secretly.

Unidentified Male: Trying to get rid of all the secrets, they ought to be able to.

Unidentified Male: I think secrecy comes out.

Unidentified Female: Actually, that is a great idea. I like the whole idea but just focusing on unlocking the secrets of nature you could show how this discovery is made in the context of atomic energy led to a lot of unlocking of secrets of nature. It led to the human genome project which then in turn of course was led to all these medical advances and understanding of disease and functions and so forth.

Unidentified Male: I say play on that, play on those two terms of it.

Unidentified Male: It is a sustainable argument.

Unidentified Female: I am not trying to argue, I am just saying.

Unidentified Male: No, no I am not sure the sustainable connection.

Unidentified Female: Concept.

Unidentified Female: It is okay, just details. It was not the very best example but there are others.

Unidentified Male: I want to go back to the question, a couple of assumptions. From the way we are talking it is not at all [01:36:00] a science exhibit it is a technology exhibit, it is a history

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exhibit, it is about why technology happens and what happens to it. We do not even have to talk about a chain reaction frankly.

Unidentified Male: A what?

Unidentified Male: A chain reaction.

Unidentified Male: I certainly hope that there is science in it because I think that that process the understanding the secrets of a bomb really means understanding some of that science.

Unidentified Male: But I do not think that is what we spent ninety percent of our time talking about.

Unidentified Male: That is true, which I think might be a problem.

Unidentified Male: Well here is a corollary if we decide it is okay that it is not really a science exhibit that it is engineering, it is a science of society, it's a history exhibit. In that even science centers are probably not the best place for it. History museums, and my new favorite [01:37:00] [bad audio] there are science centers, they are all over the country, all over the world. They have big space and military technology is a part of almost all of them. I think actually they would make a very receptive place. Their visitorship is families but more weighted towards adults than most science centers are.

Unidentified Female: I would say the people that go to those museums are predisposed to enjoy displays of military armaments and have that mindset about them. I am not sure it is the best audience for the entire gamut of ideas that we are talking about here, really.

Unidentified Male: We would be stretching them and asking them to look at armaments in a somewhat different way and I think that is a good thing to do.

Unidentified Female: I would not say do not go there, and I actually think science centers, well actually they are science and technology centers mostly. This is big technology not just big science.

Unidentified Male: And science and industry.

Unidentified Male: I do not agree that this is about science.

Unidentified Female: I think it is perfect for those.

Unidentified Male: None of this would have been possible without these fundamental scientific discoveries.

Unidentified Male: There definitely is science component to it. You are saying most of the things that sparked the discussion round this table have not been the cross-section of U235. It has been about these motivations. Another suggestion I like to make is to think about this as an international exhibit. I can see this being much more warmly received and anticipated [01:39:00] in England and France and Germany and Denmark and Sweden where science in society is much more popular

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topic to talk about. they have many more exhibits than we tend to have in this country that do look at the historical and social dimensions of technology.

Unidentified Male: Right.

Unidentified Male: The important thing to think about when we do that though is two things. One is that eighty-five percent of science centers in the United States are private non-profits which means the only thing they have to deal with are their Boards of Directors which is not trivial of course. However, science centers in Europe who get heavier government funding also have to deal with some heavier biases and perspectives. We are talking about community particularly in western Europe whose consciousness of civil liberty is even more extreme than ours in many ways in the post-World War II era. They are by God going to want to get some message in there and we need to be prepared for that. I am sure we will, but it will be automatic in something once it reaches Europe.

Unidentified Male: There are programs that would have to be somehow included as well, right.

Unidentified Male: Also if this does go international there is undoubtedly going to be a supplement that will come from the country where it is being shown that will connect it with the particular circumstances whether it be Finland or Sweden or Germany or wherever. Which is fine.

Unidentified Male: I like to see us do an exhibit that we would be proud to show in Japan and people in Japan would actually, like that first film that Bernauer released in 1970 *Hiroshima-Nagasaki 1945* when Akira Kawasaki who did the original footage saw it, he commented and brought him to tears he said. He said I did not think the Americans could do a film like this. He said it was the same way we felt in Japan. I think for us to do an exhibit that met that test would really be an achievement.

Unidentified Male: That would be a challenge.

Unidentified Female: Just argue a little bit with what Allen said about not being science. I guess I came into this meeting with the assumption that the science would be part of the exhibit, that you would show chain reaction, that you would show how to make U235, Oakridge. The reason we have not talked about it is because I am not going to argue that it is wonderful we have the discussion.

Unidentified Female: We have that nailed. We do not need to go over that. we do not need help on that.

Unidentified Female: There is a component of science that I just assume would be part of it because it is part of the story [01:42:00].

Unidentified Male: Does not really make sense otherwise.

Unidentified Male: It is also the part the least interesting to everyone in this room. That is not necessarily the case of the average person.

Unidentified Female: Cameron likes it. [laughter and many speaking].

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Unidentified Male: ... we are not all interested, but in the sense that we do not want to hash it out. The guy on the street...

Unidentified Male: we are not here for that.

Unidentified Male: Probably does want to know a little bit.

Unidentified Male: Remember we are not designing the exhibit right here, we are talking a couple of levels above the individual exhibit units and the individual graphic panels and the individual objects that are going to be part of the exhibit. I have assume that, that the basic science behind the technology is a vital part of this exhibit.

Unidentified Male: Yeah.

Unidentified Male: But just a process point then, normally at the next stage, not today, not this week, we would write a big idea, we kick it around, we write sub-big ideas and we would write some goals for the exhibit. People leaving the exhibition will and now there is a list. On that list might be understand that U238 is much more common but is not finishable, U235 is very rare, can be made and is finishable. That would be one of the things we would hope people would take away cognitively. We would have other things that we want them to take away like the connection between the Manhattan Project and the security state. The connection between the Manhattan Project and dreams for solving medical issues and basic knowledge coming out and unlimited energy—the desire to win a war and to not get beaten in the war. We would have a list of these things we want people to walk away knowing, understanding, perhaps feelings we would like them to have. Maybe we would like them to be ambiguous about the role of big science and technology.

Unidentified Male: It has to be upscale.

Unidentified Male: There is going to be a long list. I think it is a little too early to write that list now. We are going to write it. My comment was that I did not think it was going to be dominated by science. I predict that when you finish this list it is going to be seventy percent history, it is going to be maybe twenty percent talking about science in society and ten percent is going to be things like U235 or U238.

Unidentified Female: How do you distinguish between history and science in society, just as an analyst's point that will help me.

Unidentified Male: For me, being neither historian [01:45:00] nor a social, I would say the history is the documentary evidence, the dates, the people, the circumstances and science in society is the interaction between the technology and the science and people's motivations and opportunities and challenges.

Unidentified Male: It is a fact that Oppenheimer and Truman had a discussion, historical fact that there was a discussion. What evolved from that dynamic is a question of science and society.

Unidentified Female: With that breakdown with science museums may not be interested in an exhibit like that.

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Unidentified Male: This is a tricky question. It is how we market this exhibit for example to a science center. I think it will be challenging to them, they would be much happier with an exhibit about how airplanes fly. Kind of straightforward but there is an increasing feeling that they need to talk about the consequences and the next generation science standards are going to force both I think museums and the schools to look at science and society issues which they otherwise could easily ignore. It certainly is going to force us to start looking at engineering as a human enterprise which they generally, engineering is just applied science, we do not have time for it this year. I think there are forces that are going to make this exhibit in higher demand than it would be today. That is my own opinion. I think I am being challenged on my version of science in society.

Unidentified Female: You have the misfortune of having a sociologist in the room and the only thing I say about this is that any one of the acts that we are talking about, a factual interaction between people is ipso facto a social interaction between people. It does not mean that every single thing you have to say well how did they come to see each other in the hallway or any other kind of complex thing like that. I think to separate out that what you are asking the question about how do people come to be part of this project. How were they recruited? How did people come to be spoken to about doing this. I am imagining a map of some kind where people were and then Oppenheimer was going around, little mini-train moving around. Then he is trying to recruit people and talk to people and that were asking questions or talking about what motivated people to go from this place to this place. Why did they decide to do this?

Unidentified Male: That is a presentational issue.

Unidentified Female: But the presentational issue again as a technical presentation issue to separate out something to say well this is just the historical thing [01:48:00] that the social thing comes later. I will tell you another way to think about social for me is to say well what about publics who were not part of this. That is another way to think about the social implications or social things is to say that we have a separate thing to ask once the privacy was over, etcetera, how does it interact with public things? I am not trying to push my own particular disciplines or anything else, I am here largely because I have done historical work on a particular set of issues. I do think that in humanizing this and making it an interesting set of things for people to look at and participate in the more things that we have that are related to actual people and their lived experience I think will be valuable.

Unidentified Male: I think again I do not think anybody disagrees, I think it is a matter of presentation. When we talk about distinguishing factual history from science in society is a false assumption, false way to describe it. all I think we mean here is that if you walk into an exhibit and you see a picture of Kennedy and Khrushchev sitting side by side as I show on the slide there, it happened, we know it happened. If you do not give more information, if you do not give context, if you do not make it relevant factually it happened in history. Oppenheimer / Truman had a meeting, it happened in history. But that is not enough in a presentation point of view. In order to capture exactly the points that you are making and our exhibit has to embrace that level of detail.

Unidentified Female: Thank you.

**[Exhibiting the Manhattan Project: Presentation Strategies and Objectives - Part III](#)**



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Unidentified Male: I think Alan's analysis of the outcomes as the next stage in this is not only going to help us formulate strategies for each outcome but is going to be a real reality check on just how broad can this be, how many segments are there in the Venn diagram, how big is each segment. It is going to force us to come to grips with the economics of this project which Cindy has absolutely going to have to have control over as she takes this forward. Is this a five hundred dollar project or five million dollar project? Is it two hundred square feet or twenty thousand square feet. My experience has been that it is really easy to draw the lists. Then when we start flushing out each of the elements on the list and looking, what does it take for us to get to this particular conclusion, to get to this particular outcome. What objects are we going to have to obtain? What are the sources for the information, etcetera. Then we get real, real fast there.

Unidentified Male: Do you prioritize your list of hopeful elements of an exhibit, setting your goals?

Unidentified Male: My experience has been you want to prioritize but [01:51:00] reality intervenes. It may affect whether that priority persists. That is why I start looking at things like if we wanted to be object based, if we wanted to have interactive experiences of some sort what are the resources that we have to apply in order to get to that particular point. Particularly if we are dealing with historic objects. As has come up here several times, there are historic objects and then there are historic objects that carry a whole lot of baggage that may be available but may not be appropriate for exhibit.

Unidentified Female: Then when you do some front-end research and figure out what your audience knows or does not know and all that, you may realize there needs to be another portion that you did not envision in order to set the stage and bring them to the point where you can begin engaging them.

Unidentified Male: As we get to that point, then as we said it moves out of this room really fast and gets out to both the potential audiences and what are their expectations, experiences, backgrounds, awareness and the potential array of venues. What are their requirements, expectations, etcetera.

Unidentified Male: And the potential array of funders.

Unidentified Male: Yeah.

Unidentified Female: I have a very practical question about the day's parameters and you are throwing out twenty thousand square feet. I think Dubai is the only place, Shanghai, I mean that is extraordinary.

Unidentified Male: That is a big spread.

Unidentified Female: Are there any of our museum...

Unidentified Male: For dramatic purpose.

Unidentified Male: Twelve to fifteen is doable.

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Unidentified Female: Twelve to fifteen but how many museums have space for twelve to fifteen.

Unidentified Male: Three thousand to five thousand.

Unidentified Female: Three thousand to five thousand seems to be an average size. Now that is twice as big.

Unidentified Male: That depends on what kind of venues you are looking at.

Unidentified Male: The bigger institutions can do big exhibits.

Unidentified Female: You are saying twelve to fifteen.

Unidentified Male: Twelve to fifteen, our place was just a medium size museum does that. I would say the major ones around the country, the big ones around the country could do that.

Unidentified Female: How much is the cost per square foot these days?

Unidentified Female: Two hundred dollars I just looked at it.

Unidentified Female: How much?

Unidentified Female: Two hundred and forty dollars.

Unidentified Female: That sounds very low.

Unidentified Male: That sounds low.

Unidentified Female: For what kind of exhibit, that is low to me too.

Unidentified Male: I would say six million dollars for we are doing a project, which is six million dollars for twelve thousand square feet.

Unidentified Male: Again, it depends if you have a lot of interactive. If you have some high-end computer simulations then you are going to be at the high end of that. I have gone up to a thousand dollars a square foot.

Unidentified Female: That is to develop it.

Unidentified Male: That is everything.

Unidentified Female: Not including travel.

Unidentified Male: Not including travel, but delivered to the first venue.

Unidentified Male: Research and development [01:54:00].

Unidentified Male: You could also do two small versions which we have done before.

Unidentified Female: Right.

Unidentified Male: You do not just want this to go to main areas and drive a smaller one that can go to smaller places.

Unidentified Male: Your question about priorities it is really hard to set priorities right now because I know what I want to see in this exhibit you cannot give that a low priority. Peter knows what he wants, cannot give that a low. It is easier to do those priorities once you built your list of everything you like to have, your learning objectives, your big ideas then you put that up against reasonable sizes and cost and then you set a force. I will have to admit you may have to take out my favorite bit or at least give it a lower priority until we can see if we can find chief fabricator.

Unidentified Female: I have been working on this for a decade and have been with four different museums that have helped me design four different exhibits that do soup to nuts. I mean maybe not as many nuts in it, as we have discussed, but lots of soup. We were looking at five thousand square feet with a small twelve hundred square foot and it was three eighty-five, that is expensive.

Unidentified Male: I understand that is a perfectly reasonable set of numbers, but when we compare that number to how many square feet we need for each of the topics we talked about today, I think we will discover...

Unidentified Female: Quickly we are into the twelve thousand square footage.

Unidentified Male: That is where we will prioritize, we will decide we really cannot afford a fifteen and twelve thousand square foot or we chose not to because there are not enough venues that can take it. Whatever those decisions are, the next piece after that will be okay, then we have to prioritize.

Unidentified Female: This is from a survey on museumplanner.org that said the majority of traveling exhibitions are between one thousand and five thousand square feet, that is 67.9%. Then there are three different ranges of prices, you have your twenty-five to seventy-five dollars per square foot, about twenty-five percent; thirty percent of them are a hundred to a hundred and fifty and then twenty-five percent are two hundred and fifty to three hundred and fifty per square foot.

Unidentified Male: The thing is museum planner does not address the uniqueness of what we are dealing with here with interactives. That is where the costs really start.

Unidentified Female: Potential artifacts.

Unidentified Male: Yeah and it may be you have a lot of cost liability issues associated with collections as well. If you are going to actually move objects around. I think the other aspect to this is that you can do in five or six thousand square feet, you can do exactly what this Venn diagram we are describing can do very, very easily. It is just how compelling do you make your message [01:57:00]. When you have a hard time delivering a compelling message your interactives can sometimes make up the difference. Maybe you do not need that if you are really compelling you essentially have little pods that people visit.

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Unidentified Male: I have had experience with that because I go the Hiroshima museum every year and the Nagasaki museum every year. The Hiroshima museum is big, a much bigger scale, my students are always much more moved by the Nagasaki museum and it does not have interactive, minimally but it is a very powerful intellectually and emotionally experience of that is a totally different experience than the Hiroshima museum which they tend not to like. It is dealing with a lot of our issues and fairly I think low budget fashion but the impact is enormous.

Unidentified Male: That is a selected group.

Unidentified Male: Yes, but I see the difference impact on me and others also between those two museums and it is possible to convey that people come to this museum to our exhibit are likely to be self-selected to some extent also.

Unidentified Male: What is the size of the race exhibit?

Unidentified Male: It is about fifty-five hundred I think.

Unidentified Male: Yeah that is what I was going to say, it is about five thousand, you got a lot in in five thousand square feet in that exhibit including some interactive stuff.

Unidentified Female: Just being very practical it seems like that is the range we should look at, having also opposed to a lot of funders. This is a niche subject and I think if we can convince the PEW Charitable Trust that indeed their audiences would benefit from seeing the context for getting to zero, getting the threat of nuclear weapons under control as something we need to reach out to the public on, that would be good. I think the STEM education obviously we need to build the science component in there to attract that kind of funding but that is clearly a source of funds, presenting it that way. It is all about the funding, we do need folks to fund this without actually getting trampled by someone who starts dictating. You have to say this is the best thing since sliced bread, it is going to be keeping the funders, and we want your dollars but not necessarily your script.

Unidentified Male: I think you have gotten a lot of good input over the past couple of days and distilling this into your message is really going to be a challenge, it is going to be interesting. I have to say that I am delighted to be here and I am glad I am here. When I [02:00:00] first saw it, I thought really, but I really, really understand it a whole lot more now. If you are the funder, you do not want them to be saying - really.

Unidentified Female: What was it that made you go - really?

Unidentified Male: Manhattan Project alone. I said it is a history lesson, okay. Conceptually I understood there is a lot coming from it and to some extent, what we discussed over the past few days is not, some of it is truly revelation and I appreciate what I have gotten from that but some of that its depth of appreciation of the significance. We are going to have to set that out there soon so that people understand the compelling aspect of this thing called the Manhattan Project so they do not say it is a history project.

Unidentified Female: Do you agree that this is smart to try to think about this as a science center / science museum as a home base. We have to think of an audience or a platform.

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Unidentified Male: I can make an argument for why it is an interesting history exhibit. I think you get less people, you get World War II history buffs will spend time in that exhibit. I think it has a larger societal relevance where science is a good launch pad for it. We like the fact that science is more of a gray area than people perceive it to be. We like that. The science center of today, is actually more associated with this, they find it has more attraction for them and may have been the case in the past. I am over generalizing of course but you have twenty science centers in my own association that are the forty-five million dollar and above operating budget. They are going to be large enough to not only get it but also absorb it so there is no lack of audience.

Unidentified Male: I like this Venn diagram approach just because it is so flexible also. I think it resonates with this whole how people actually visit exhibitions, they do not go literally through these, but I like that they even take a component, take it out or put it in to mix and match. I think it would be very hard to have a history exhibit about the science if only because you need the vocabulary to understand these kinds of things.

Unidentified Male: There are, as Bud is saying an increasing number of science centers that are seeking to move science out of the let us make the balls roll and the balloons pop into the relevance of science in everyday life [02:03:00]. As well as the way so much of the world we live in has been formed via scientific thought and scientific process. I see this as having a real relevance to the modern science center.

Unidentified Male: I tell you what we could do maybe to help his process a little bit is we might ask what about this particular exhibit, do you want to catch up to or connect to you already tend to see at science centers. I can tell you right now every science center gets a chance to do something on space, they are going to have some NASA stuff, they are going to have rockets, they are going to have things lead up to the space race. Anybody that is anywhere in the energy or even close to anything that is energy related it is going to have something about energy it is going to be a nuclear component to it somewhere. There are pieces that get close to the pods that you will have in your Venn diagram anyway. It is just a subtle component of what you are doing but you might want to see what gap you are actually filling in a message that is already being created at some level within the science center community. You may find that the Manhattan Project is written in small letters somewhere, at the tail end or at the beginning of a lot of other exhibits that are done for different reasons.

Unidentified Male: Would the space be about five times the size of this room approximately.

Unidentified Male: I do not think this is a thousand square feet, a little less.

Unidentified Male: Maybe six times the size that is a pretty big exhibit.

Unidentified Male: Sounds pretty big.

Unidentified Male: Turns out not to be that big, once you get furniture and walls and space.

Unidentified Male: The whole question about traveling exhibits is what they can afford these days to pay for and we found we often had to go to smaller exhibit because one would go for ten thousand and another for thirty-five thousand.

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Unidentified Male: We do it by trucks, how many trucks, three truck exhibit a five-truck exhibit.

Unidentified Male: The nice thing about the Venn diagram and the modules again is that you might be able to design this so that it will fit a twenty-five hundred square foot, but then you have three components in storage because the next time it is a five thousand square foot.

Unidentified Male: I just do not think you want to limit yourself to the biggest institutions. I think you want to get it out as far as possible.

Unidentified Female: We can have a twelve thousand square foot, I mean very simple.

Unidentified Male: Twelve hundred, do you mean twelve hundred?

Unidentified Female: Sorry the twelve hundred.

Unidentified Male: If it is libraries and clubs and things like that, we did that with ours and it was great, and they travel longer than the main exhibit.

Unidentified Female: Now next steps, five minutes [02:06:00]. Do you think we have done enough I am worried about pleasing our funders, NSF whose expectation is that we provide some feedback to them on the field of informal science learning. Have all these nuggets been offering can I put that in the column, what we have said.

Unidentified Female: I think some of the latest stuff that just came up about where science centers are going and what Allen brought up about more of science in society, those are really, really good nuggets for that part of it.

Unidentified Female: Is there further research that is another question they had. What kind of scholarly research ought to be recommended to pursue this further for the benefit of the field.

Unidentified Female: There is a Pulitzer Prize-winning book.

Unidentified Male: I was going to say, I was not thinking that moment of the literature side, but following up on the NSF portion of it. one of the things that there is a huge emphasis on NSF right now is what they call the One NSF Concept and the notion that the one thing that we want at the informal science and people want to do is show cross-directory relationships. That this learning is relevant to other aspects of science. We certainly can demonstrate that and you want to say that upfront because they are focusing on innovation, focused on One NSF. If you get those elements in early, you have hit your mark.

Unidentified Male: You already have two program elements funding this.

Unidentified Male: Exactly.

Unidentified Male: They are already moving in the direction that they see this as cross disciplinary.

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Unidentified Female: I was a program officer in the program that Fred is in last year. I saw this proposal come through, I was on the proposal, Fred was running it. I will say that it would be great if NSF were One NSF but just a moving in this direction it is the case that they have set up terrific person running the ISE program there. If people are [phone ringing] it will be useful for people interested in furthering ISE at NSF to help Fred and Al have new resources and new kinds of information. This kind of stuff you museum people you can spout out because you know it, it is easy for you, they do not know all those details. Anything that you can say about what you have learned here, anything like that will be really helpful to them, very helpful in furthering the cause of ISE at NSF.

Unidentified Male: You are right, Al knows it in excruciating detail because he comes from a science museum environment and he has seen my presentation three or forty-eight times. [02:09:00] what is really important is that across ISE there is not an appreciation of all this never mind One NSF. One ISE would be nice.

Unidentified Female: The SCS program wants to fund things that are across the foundation but without more information delivered to people like Fred who has this interdisciplinary program it is less likely that key eyes are going to be encouraged to even think in these terms. You want people to think about the informal science education. When you have a project how could it be used by people in museums, what could you. people do not know about this and NSF does not have available resources to be helping people even move this forward. I know that whatever comes out of this that Al and Fred will appreciate having the latest resources of information available to them.

Unidentified Male: My short list of the nuggets that comes out that should make both Al and Fred happy. First, this is not the usual kind of proposal that comes in for an exhibit. I think it is not a typical proposal would be nanoscience today, the Higgs Boson discovery, the story of the international space station. These are more typical proposals. This proposal really is an interdisciplinary proposal involving history and society and technology and science that is big challenge. If they fund one grant a year that does that that would be unusual. I think that is great. Second I think one thing we learned was that the history side of it, we are ready to talk about a Venn diagram for the whole thing, that is remarkable. I would not have been able to identify more than a third of things that are going to be on that diagram before coming to this meeting yesterday morning. I think I see where the areas of unresolved really interesting and important questions lie and the areas where there is broad consensus. I would hope that the people from the history and social sciences side got some feeling from those of us on the museum side on both the constraints and the abilities that we work with and how to take what they think is interesting the various ways in which we might try to exhibitize it, sort of like webinizing. How would we exhibitize it and the fact that it is not just exhibits, we talked a lot about theater, Jay's institution is the one that really invented the concept of science theater, it is all over. This is really powerful place where you would use that technique [02:12:00]. I am really excited about these debates that they are going to stage. I think those are nuggets that are more generally useful and would encourage more projects like this, I mean I imagine we are all focused so much on the Manhattan Project but we can think of ten different projects right now that involve some sort of large-scale interaction between site-specific technologies and society and science and engineering. I think that is all generally useful. In particular I think we really set up for a group that is actually now shaping this actual project. We do not have all the background we need, we do not have the front-end evaluation, but boy do we have enough important material and we have a sense of the things we really have to think about including.

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Unidentified Male: Then remembering also that there is this ongoing conversation with Art's service so this is not being done in the absence of that potential very significant initiative. Then something we did not talk about is and I have been pretty critical on this, what we did not talk about is the possibility of their being connections of this project with the national laboratories and the Department of Energy. Just because the Manhattan Project is/was located on those properties and there are those existing physical connections.

Unidentified Male: I would say just from a funding point, I know you have to meet objectives here. I tell you I get two pages, three pages whatever it is together, I would get it to Jim Leech over at NEH in a heartbeat. He is saying how do we use science and history together. I would get it to IMLS because Susan Hildreth really likes Jim Leach and likes the idea that we are going to use libraries and museums and those kinds of collected information. Then my message back to NSF is how much Jim Leach and Susan Hildreth like it.

Unidentified Male: Interagency funding.

Unidentified Male: Yeah really.

Unidentified Female: Which can happen.

Unidentified Male: Well for IMLS it almost has to happen, you need that match. You have all the makings for this here so I love them to death over at NSF but they are certainly not the only game in town for something like this.

Unidentified Male: I think also what is a little different about this project is it really is science in history not history in science. That is different.

Unidentified Male: That is what I love about it.

Unidentified Female: I think historians in science [02:15:00] would like a claim to science in history too.

Unidentified Male: They would or they would not.

Unidentified Male: Would.

Unidentified Female: But this just as a tutorial I am always anxious to go for the implementation grant, but here I am with a conceptual planning grant. We took a couple of giant steps backwards, it is not backwards at all, but I do not want to make the same mistake thinking well we are ready to leap to, it seem like I am going to need interim funding to interim planning and work this through.

Unidentified Male: You will get that from NSF anyway at this point because it is going to take them a little bit longer to grasp what in the current budgetary climate for them to grasp everything you are trying to do. There are automatic grasp is going to be why don't we focus on planning grant here, why don't we focus on taking this to its next step rather than...



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Unidentified Female: I would be talking to all of the above names, Jim Leach and Susan Hildreth before planning grant.

Unidentified Female: Should we talk to NSF for a planning grant, is that what you are recommending?

Unidentified Female: Right.

Unidentified Male: You have the resources and the time you could design it larger, make them push back because this will happen. If you develop a full grant they will say okay there are elements we do not quite have in place here, so why don't we push back the planning grant.

Unidentified Female: Okay.

Unidentified Male: There is nothing wrong with doing that. They are going to ask for a concept paper either way.

Unidentified Female: Sure.

Unidentified Male: you are going to have to put together the concept paper. I think you look at how comfortable you are which involves you still have to do the literature search, which you will not have any trouble with.

Unidentified Female: Thank you so much.

Unidentified Male: Thank you Alan.

Unidentified Female: Have a good trip back.

Unidentified Male: You are still going to need your literature search, still going to need to develop a budget all those sorts of things.

Unidentified Female: You might as well go for it.

Unidentified Male: You might as well do the concept paper and then see where it takes you.

Unidentified Female: This is a good question, Andrew just asked am I going to circulate it? you are now all anointed as Advisory Committee, for what are we calling this [laughter]

Unidentified Male: Secrets of the Bomb.

Unidentified Female: Secrets of the Bomb.

Unidentified Male: I like it.

Unidentified Female: Okay, again I appreciate you are all very busy but whatever you can do to give us advice. Yes.

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Unidentified Female: I evaluated at a conference last year, the Natural History.

Unidentified Female: Just three more minutes.

Unidentified Female: National Museum of Natural History hosted a conference last year that I evaluated and one of the things that they did because people were so [02:18:00] excited about the topic same as here, they were very galvanized. One thing that they did was the set up a Wiki and they pasted the entire conversations that took place and then people could look at it when they got home and had a chance to process everything they had heard. They can continue the conversation as it were and that is probably something you may like to consider as you continue thinking about it so you can keep the conversation going.

Unidentified Female: Sure, we have a Wiki on the history but I think what you are suggesting is a Wiki on the conference.

Unidentified Female: Right that is what they did.

Unidentified Female: That is not hard to do.

Unidentified Female: We will have the transcript of the entire conference, except when those times when we are all talking at once.

Unidentified Male: That will be redacted.

Unidentified Female: We do want to take the presenters, those segments and probably have those for the public could benefit from good thoughtful presentations. Those would be up and then I can put up in this Wiki everything we are coming up with including the two-pager. I am used to using email just because I read my email box. I do not know probably I could send the email, I could send it both ways.

Unidentified Male: Just send a link.

Unidentified Female: What is that?

Unidentified Male: Just send a link by email.

Unidentified Female: Yeah a link and prompt people to respond. It is easy to say you want to continue the conversation but you get busy when you get back to your work and your life.

Unidentified Male: Respond by.

Unidentified Female: Respond by certainly we need to figure this out or what do you think about this big idea statement, let us kick it around.

Unidentified Female: Christie could you send us the link to the Wiki that you are referring to so that we could see how it was modeled.

Unidentified Female: I do not have it on me.

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Unidentified Female: Okay, thanks.

Unidentified Female: People found it very useful so the participants liked the fact that they could go back. What they did also is they went back to their organizations since not everyone could come to the conference, they could take it back to their staff and talk about it and say here is what we discussed and how it applies to our organization. It is a slightly different focus than what this is about, but share it with others.

Unidentified Female: Good and there is no I do not know at one point but the National Park Service had a Lewis and Clark exhibition along which they had a tenth of many voices. They invited people as they traveled along the trail to speak, to add to this. It may be that by a certain point, maybe not right away but when we are comfortable enough inviting others, [02:21:00] the public and all these other stakeholders that we need to begin to hear from and slowly invite them to say how does this look, what is missing. So they have a chance so the tribes around Hanford or pueblos around Los Alamos or the Hispanic communities, all these people can say do not forget this.

Unidentified Female: What we were talking about earlier if you can do some in-house evaluation as far as testing, concepts, ideas at these places that already exist. You have resources to do that that would be a good way to start.

Unidentified Female: Right.

Unidentified Female: Filtering out what potential audiences are interested in and what they do not understand and do understand, their expectations.

Unidentified Male: Of course our audiences may not be...

Unidentified Female: Typical. Well just as a place to start.

Unidentified Male: Right.

Unidentified Female: I would think that NSF would think okay you already started to something informally, now you can do a formal study.

Unidentified Female: Any other suggestions? I know we promised four o'clock, but this has been so productive and you have all been so terrific, energized and energizing. I think we off to a good start.

Unidentified Female: You have been a great host.

Unidentified Female: Thank you, [applause].