(Image: The National WWII Museum, 2018.233.520_1.)

COVERT OPERATORS

GRADE LEVEL: 7-12 TIME REQUIREMENT: 1-2 CLASS PERIODS

INTRODUCTION

Over 100,000 people from across the United States participated in the Manhattan Project, whether they supervised safety measures in the reactors, helped build the roads and buildings that made up the secret cities, or worked on the construction of the atomic bombs directly. In this lesson, students will read excerpted quotes from oral histories given by those who participated in the Manhattan Project, as a part of the "Voices of the Manhattan Project" conducted by the Atomic Heritage Foundation. Reading the quotes, students will extract context clues to determine the primary site where each individual worked, the kind of jobs each individual did to contribute to the building of atomic weapons, and whether or not the students think each individual was aware of what he or she was building. By piecing together these context clues, student will use critical and analytical thinking skills to create a profile of a Manhattan Project worker and how that person's efforts led to the making of the world's first atomic bombs.

MATERIALS

+ Copies of the of the Introductory Essay, "Destroyer of Worlds"

+ Copies of the essay "Life in a Secret City"

+ Copies of the Student Worksheet

+ Map of primary Manhattan Project sites

+ Videos of Secret Cities – Clip from "Critical Past" video

OBJECTIVES

In assessing the details featured in quotes from oral histories, students should be able to apply critical thinking and analytical skills to determine information about Manhattan Project workers. Using the included essays to provide necessary background information, students will produce a critical assessment by pairing primary and secondary sources. By combining source materials, students should be able to provide a general sketch of each worker, who that worker was, and what role that worker contributed to the Manhattan Project.

COMMON CORE STANDARDS

CCSS.ELA-LITERACY.RH.6-8.1
Cite specific textual evidence to support analysis of primary and secondary sources.

CCSS.ELA-LITERACY.RH.6-8.9
Analyze the relationship between a primary and secondary source on the same topic.

CCSS.ELA-LITERACY.RH.9-10.2
Determine the central ideas or information of a primary or secondary source; provide an accurate summary of how key events or ideas develop over the course of the text.

CCSS.ELA-LITERACY.RH.11-12.2
Determine the central ideas or information of a primary or secondary source; provide an accurate summary that makes clear the relationships among the key details and ideas.

ONLINE RESOURCES

ww2classroom.org

Secret Cities Video Clip

Map of Manhattan Project Sites

NATIONAL STANDARDS FOR HISTORY

HISTORICAL THINKING STANDARD
The student conducts historical research; therefore, the student is able to demonstrate the following:

- Identify the gaps in the available records and marshal contextual knowledge and perspectives of the time and place in order to elaborate imaginatively upon the evidence, fill in the gaps deductively, and construct a sound historical interpretation.

- Support interpretations with historical evidence in order to construct closely reasoned arguments rather than facile opinions.

PROCEDURES

1. Before beginning the lesson, have the students read the included essays in the curriculum guide, "The Destroyer of Worlds" and "Life in a Secret City." Start the lesson by showing students the video clip of footage from Hanford and Oak Ridge. Have students briefly outline in a full-class discussion the key points they understand about the Manhattan Project, the primary project sites, and the kind of work people who participated in the Manhattan Project did.

2. Break the class up into small groups and give them copies of quotes from two different Manhattan Project workers and copies of the Student Worksheet. Instruct the class to read through the quotes and extract context clues about that person. Using the essays as a reference guide, have the students piece together important details about that individual.

3. As the students fill out the worksheet, remind them that is not always clear whether an individual knew about the construction of the atomic bombs. Some workers knew outright, while others had an idea of the work they were doing. Some did not bother to find out at all. Ask the students instead to make an informed guess when answering the final question, and you can provide the full details once the exercise is complete.

4. After the students complete their worksheets, have them discuss in a full-class discussion the workers the students read about and what the students thought of the work that was done. Through this discussion, the instructor and students together can place these individual stories into the broader narrative of the Manhattan Project.

ASSESSMENT

Through both class discussion and reading of the assigned materials, students should demonstrate the ability to think critically about details presented out of context. In extracting key details, students should show how they can identify and apply important details to form a historical narrative and make informed guesses about the individuals they study. Written responses should feature the inclusion of specific examples to illustrate and support the arguments they present. The concluding discussion should bring forth an ability to place individual stories in history within the larger historical narrative of the Manhattan Project.

EXTENSION/ENRICHMENT

1. Have the students compare the profiles featured in the essay "Life in a Secret City" to the Manhattan Project workers highlighted in this lesson plan. In written responses, have the students outline the similarities or differences that stand out to them when analyzing the individual stories of those who contributed to the building of the atomic bomb. Ask the students to address why certain similarities emerge and what larger conclusions they may be able to draw about the nature of work conducted in specific secret cities or within the Manhattan Project overall.

2. Have the students access additional oral histories featured on the "Voices of the Manhattan Project" database (https://www.manhattanprojectvoices.org) offered through the Atomic Heritage Foundation. What other stories are students able to find that change their understanding about the Manhattan Project and the people who contributed to it? In a short paper, have each student present a profile of the worker, where that individual worked, and how that individual participated in the Manhattan Project, making sure the student cites direct quotations from the oral histories.

EXCERPTED QUOTES FROM MANHATTAN PROJECT WORKERS

1. ROGER ROHRBACHER

Oral History Interview, *Voices of the Manhattan Project*, Atomic Heritage Foundation, (2003).

Clues from the Interview:

"I had helped mostly in B, D, and F. I came out here in April '44 and worked on instrumentation, mostly flow and temperature and pressure, and then later on radiation monitoring. Matter of fact, that was one of the clues of what was going on. None of us really knew, except maybe a dozen or so scientists."

"Matter of fact, in the early days, B—well, all the reactors were given only a fifty-sixty percent chance of operating, which brings up another question I'm surprised you didn't ask: how come there's no A reactor?"

"You know, because this whole project, Manhattan Project, was going full speed and all of the answers were not known—and when the B Reactor was first started up, things went quite smoothly. They started pulling out the control rods and the power level went up, you know, fifty, one hundred megawatts and so forth."

"I don't think any of my acquaintances figured out. I was under the impression that most people did not realize that what they were doing would end up in the atomic bomb. I think they were just kind of guessing and stuff along the way. You got the impression there was something other than a chemical plant and other than anything else, and it concerned something to do with physics."

2. VIRGINIA COLEMAN

Oral History Interview, *Voices of the Manhattan Project*, Atomic Heritage Foundation, (2018).

Clues from the Interview:

"The chemistry department had a notice one day that there would be a recruiter there if anybody wanted to be interviewed. I signed up for that. It was a woman interviewer from here, and she just wanted to interview people who were graduating in March. She described **[Redacted]** as this 90-square mile place with free buses running night and day. If I wanted to come out for an interview between Christmas and New Year's, I could do that, which I did. I had never been on a train before. I had a friend from Chapel Hill who came down from New York and met me in Asheville, and we traveled together after that."

"I decided to switch over to the chemistry, and that's when I got into the lab, and I was working under Dr. [Clarence] Larson... He was very smart. He had a lot of engineers who had come down from Yale and Harvard, new graduates. They were chlorinating **uranium**, trying to work out the right temperature and length of time and everything that you do for that. I was analyzing the chloride to see how completely they had chlorinated the **uranium**."

"I was really much more interested in the social life, you know. The cafeterias were open 24 hours a day. We had dances on the tennis courts. I was in Tennessee Eastman's, on their [tennis] team, and we had regular competitions. The rec hall with a library, and we just walked everywhere."

Wilma Betty Gray works alongside two women at Oak Ridge, TN.
(Image: The National WWII Museum, 2018.044.007_1.)

3. RAYMOND SHELINE

Oral History Interview, *Voices of the Manhattan Project*, Atomic Heritage Foundation, (2009).

Clues from the Interview:

"But let me back up and tell you a little bit about this project. It was supposed to be absolutely super-secret. Of course, all the people in our group were guessing what was going on, trying to understand why we would be working with **uranium** hexafluoride. We didn't know really very much about it."

"But when I got there, I was put on a project working on the second method of exploding an atom bomb. It was the so-called 'snowball mechanism' in which you put pieces of **uranium**, pieces of a chemical explosive around a central **fissionable** material, which is not critical. By exploding it, you squeeze the **fissionable** material until it becomes critical and explodes."

"Our part in that project was to take very large radioactive sources of the order of three or four thousand curies—which is a huge amount of radioactivity and very dangerous—and put it at the center of a ball of **fissionable** material. We used just ordinary **uranium** to [sic] in place of the **plutonium**, which would be the thing that would really be there."

"The head of our group, the guy by the name of Homer Price said 'Look, it's foolish for you guys just to keep speculating about this. I'll tell you what it's about. I'm not supposed to, so you keep quiet about this.' But he told us that we were working on a project to make a superbomb, something with a tremendous energy release, and told us a little bit about it."

4. DIETER GRUEN

Oral History Interview, *Voices of the Manhattan Project*, Atomic Heritage Foundation, (2018).

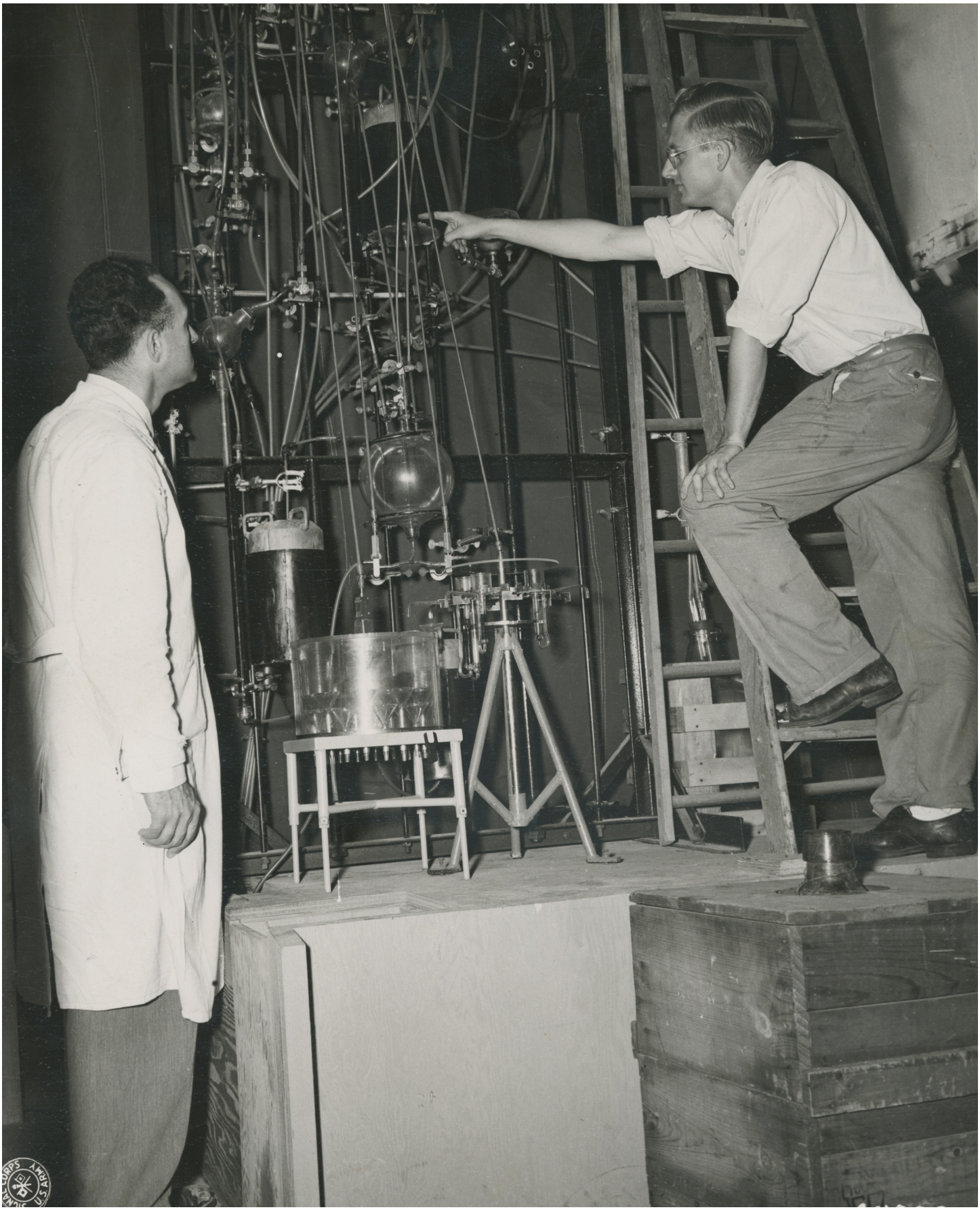
Clues from the Interview:

"Then I took a train to Knoxville, and stayed overnight… and then boarded a bus from Knoxville to **[Redacted]**. I arrived on that bus. When I got off the bus I was knee deep in mud, because **[Redacted]** was just really getting going. It was under construction, the town was under construction. That was quite an experience."

"I did talk about the work that I did in connection with the electromagnetic separation of **uranium isotopes**, which was the work of **[Redacted]**, was to prepare **uranium**-235. When I arrived there, there was not a gram of **uranium**-235 available, and within six months, we had produced 50 kilograms using mass spectrometric separation techniques, enough material for the Hiroshima bomb."

"I was assigned to the Chemical Research Division of Y-12. That was headed by a man by the name of Clarence—he later became director of the Oak Ridge [National Laboratory]—Larson. Dr. Clarence Larson was the director of the Chemical Research Division… But he was my boss there in the Research Division. All of the time that I was at **[Redacted]**, I was in that research division."

"But since I talked about it before—I don't think I said very much about what happened after the dropping of the bomb, and the reaction of the scientists to the fact that we now have nuclear weapons in the world."



Robert Garber points out chemical separation unit used for preparing fissionable materials, at Clinton Laboratories in Oak Ridge, TN.
(Image: The National WWII Museum, 2018.233.516_1.)

5. WILLIE DANIELS

Oral History Interview, *Voices of the Manhattan Project*, Atomic Heritage Foundation, (1986).

Clues from the Interview:

"The barracks were segregated. Lots of black people were out there, in construction, and lots more were just out there, not doing nothing. We would go to work and come back and some guy had been there ransacking our room. Once we came back to the barracks, and there were some guys in there scuffling."

"Some of the guys went swimming, but I did not attempt to go swimming because they said you better not get in that Columbia River, so I was stubborn about getting in that. Me, no, see that river does not give up the dead. So, I said no, no place for me, not in that river. No, sir."

"Where I was working was up at various places, pouring concrete flooring where they stored the trucks. We pushed wheel barrows through there and put matting down. Some of those guys didn't know how to push a wheel barrow. Boy, they was in trouble. That was hard work, yes, it was. I worked common labor when I wasn't in concrete. We worked at 2-East. My brother and I poured the first mud [concrete] there, and spread it out of the mixer truck. I also worked at the 100 Areas, all three of the reactors."

"A lot of people, well, none of us did not know what we were doing. We were just working. Durant would tell us, 'If anybody asks you what are you doing? Tell them you're working. What are you building? You're working.' That is what he would tell us. So, we did not know what we was building."

6. FLOY AGNES LEE

Oral History Interview, *Voices of the Manhattan Project*, Atomic Heritage Foundation, (2017).

Clues from the Interview:

"It was 1945. The bomb was being developed at that time. My assignment was to collect the blood from the research men, scientists, who were working on the atomic bomb. I had to learn how to take blood, how to read the blood cells, what type of blood cell, and all that's connected with the hematology. I got along real well in that area. They sent me to go to different sites where the production was being done, and I would draw the blood from individuals."

"I don't know if at the time when I was there, that there were any other Indians working in the same capacity I was. I almost didn't get hired at **[Redacted]** the second time, because I was a minority. It was one of the reasons. The head of the division I was to be in did not like minorities. Because I was an Indian. I just didn't ever realize why he had it against me. But that's the way the world is sometimes."

"**[Redacted]** was a very, very interesting place. We were sort of like in a prison, but you could get in and out if you had the right cards. We could go to Santa Fe, which we did on certain occasions. There were recreations like ice skating and the tennis and all kinds of activities that went on. I lived in the dormitory where several other women lived."

"I think the worst effect of **[Manhattan Project]**—not just on the pueblo, but all the surrounding area—is the radiation that has caused leukemia. I have four relatives, two are my sister and my brother, died of leukemia."

LESSON KEY FOR TEACHERS

1. ROGER ROHRBACHER: HANFORD, WASHINGTON

Work in the Manhattan Project:
Instrument Engineer at the B Reactor. Rohrbacher monitored flow, temperature, and later radiation levels within the B Reactor.

Contribution to the Bomb:
Helped with the manufacture of **plutonium** that went into the construction of Gadget and Fat Man.

Did They Know about Building an Atomic Bomb:
Not completely.

"When the official news came out that it's the bomb, as the local papers said, it's kind of a surprise and a relief and I halfway said, 'Oh, I suspected something like that.' But I think most of us really didn't, and that's most surprising."

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2. VIRGINIA COLEMAN: OAK RIDGE, TENNESSEE

Work in the Manhattan Project:
Chemist in the Y-12 Plant at Oak Ridge. Coleman worked with **uranium** yellowcake, analyzing chlorine levels in **uranium**, as well as different methods to absorb **uranium** from different solutions.

Contribution to the Bomb:
Helped with the manufacture of **uranium** that became the basis of further **plutonium** production, in addition to its use in the construction of Little Boy.

Did They Know about Building an Atomic Bomb:
Yes, but Coleman didn't ask questions due to tight security. From her oral history, she hinted at her knowledge of the bomb:surprising."

"The next day, we were leaving on a ferry to go to Norfolk to visit my sister. We get on the ferry and everybody's talking about this. One woman says, 'Nobody knew about it.'

For the first time, I said, 'Well, I knew about it.'

She said, 'You did not! The paper said nobody knew about it.'

I thought, 'Hmm, I wonder how she thinks it got made,' but I didn't argue with her."

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3. RAYMOND SHELINE: LOS ALAMOS, NEW MEXICO

Work in the Manhattan Project:
Chemist at Columbia University and member of the Special Engineer Detachment at Oak Ridge and Los Alamos. At Los Alamos, Sheline worked on the trigger for the **plutonium** bomb,

Contribution to the Bomb:
Sheline helped with the manufacture of the **implosion-method** for **plutonium**-based bombs, featured in the test bomb Gadget and in Fat Man.

Did They Know about Building an Atomic Bomb:
Yes. The head of the group Sheline worked with, Homer Price, informed Sheline about the project.

LESSON KEY FOR TEACHERS

4. DIETER GRUEN: OAK RIDGE, TENNESSEE

Work in the Manhattan Project:
Assigned to the Chemical Research Division of Y-12.

Contribution to the Bomb:
Assisted in the production of **uranium** for use in atomic weapons, like Little Boy.

Did They Know about Building an Atomic Bomb:
His interview suggests he did know, but he was upset about its use on civilians.

He stated, "There were four of us who got together. Just that small group of colleagues, we were all about the same age. We were fully aware that there was no secret, in the sense that one could keep how you make an atomic bomb a secret. You cannot defend against it. It should never be used again, and how do you prevent it from ever being used again?"

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5. WILLIE DANIELS: HANFORD, WASHINGTON

Work in the Manhattan Project:
Poured concrete to build the reactor buildings at Hanford.

Contribution to the Bomb:
Assisted in the production of **uranium** for use in atomic weapons, like Little Boy.

Did They Know about Building an Atomic Bomb:
No. Daniels discovered his participation in the Manhattan Project after the war.

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6. FLOY AGNES: LOS ALAMOS, NEW MEXICO

Work in the Manhattan Project:
Tested blood of scientists working with radioactive materials to try and protect against radiation poisoning. Agnes specialized in the study of how radioactive elements affect blood cells.

Contribution to the Bomb:
Acted to preserve the health and safety of scientists building the bomb and handling **uranium** and **plutonium**.

Did They Know about Building an Atomic Bomb:
No. She stated, "We didn't know that we were working on the atomic bomb, except for the physicists. We thought they were doing chemical warfare."

NAME: **DATE:**

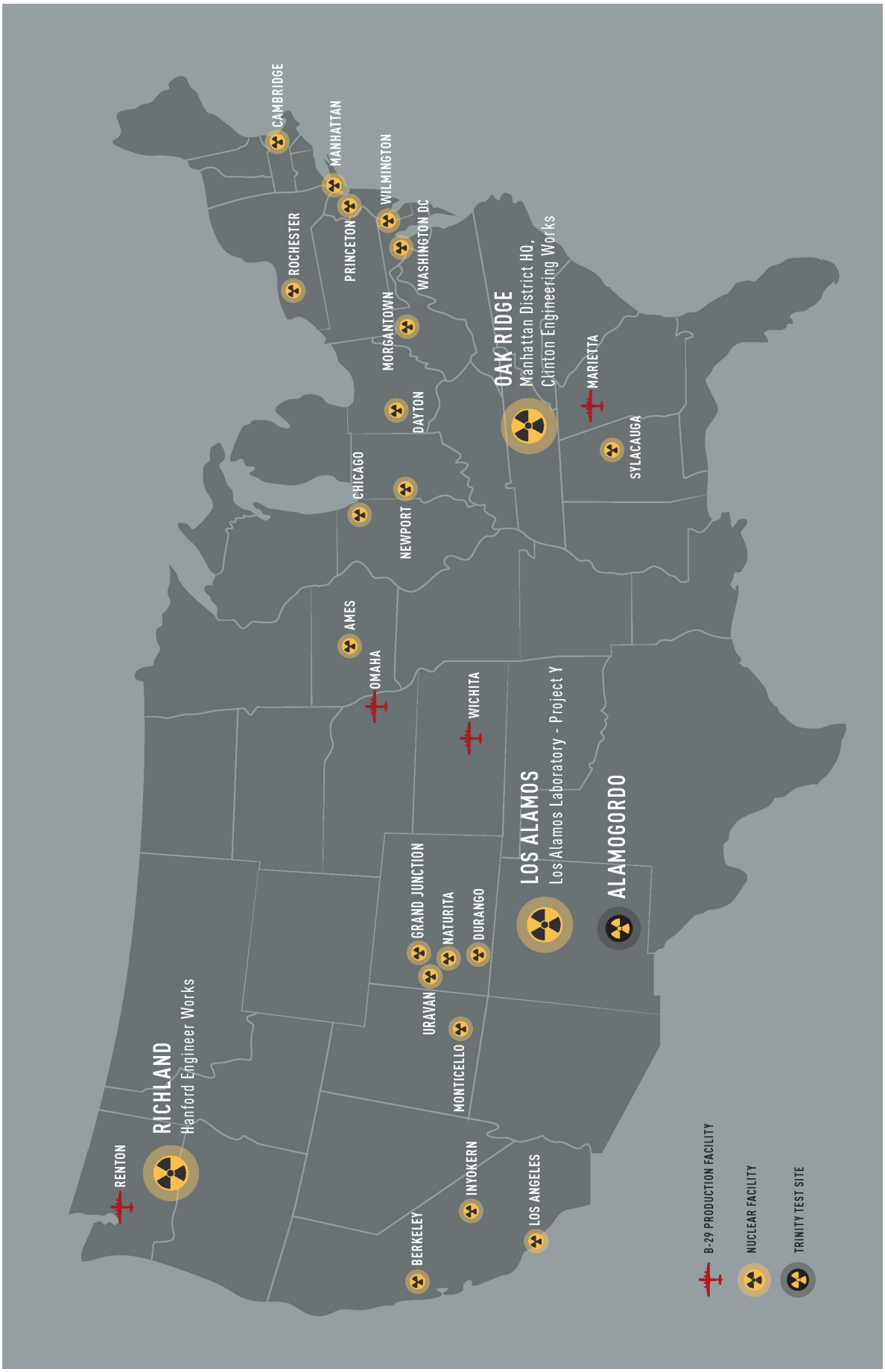
Directions: After reading the context clues for one of the people who participated in the Manhattan Project, answer the questions below to the best of your ability. Include specific examples from the clues to explain your answer.

NAME OF MANHATTAN PROJECT WORKER:

1. Based on information gathered from the quotations, what do you think was the primary Manhattan Project site where this person worked? What clues suggested that location?

2. From descriptions included in the interview quotations, what kind of work did this person do, and how do you think the work related to the construction of atomic bombs?

3. After gaining a sense of the work this person did in the Manhattan Project, do you think this person was aware of his or her role in helping to build atomic bombs? Using evidence from the quotations, explain why you think this person did or did not know about construction of the bomb.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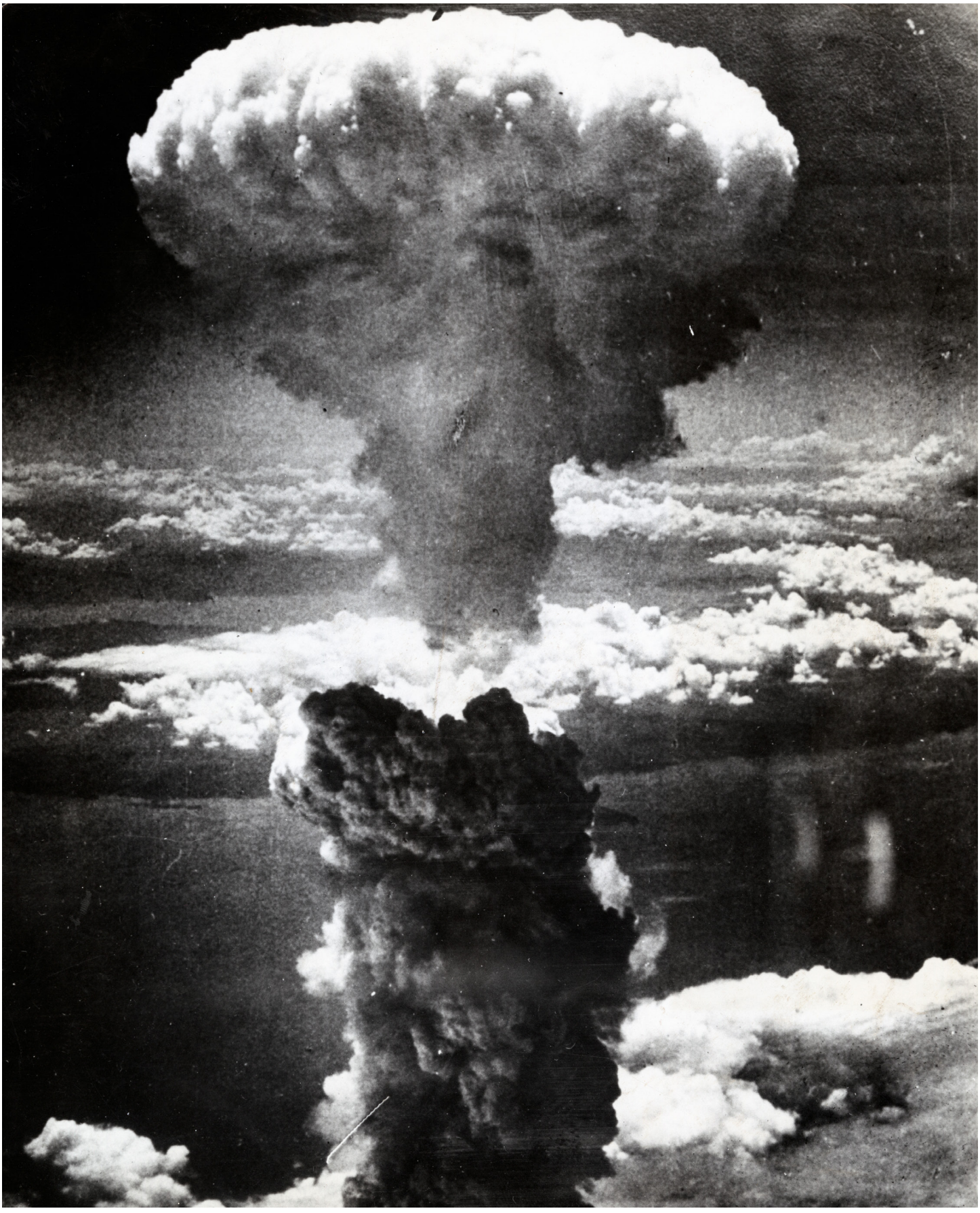

A mushroom cloud rises over Nagasaki, Japan on August 9, 1945, following the detonation of the Fat Man bomb.
(Image: The National WWII Museum, 2012.019.489_1.)