[MUSIC PLAYING]

JIM WALSH: The only way the planet dies in 30 minutes or less today is if some man who has control of thousands of nuclear weapons decides today is the day.

SARAH HANSEN: Today on *Chalk Radio,* the greatest threat to human existence and what people like you and me can do about it.

JIM WALSH: I often hear people say they can't imagine that nuclear weapons would ever be used because it's a mutual suicide pact. Yeah, well, it's important to remember we used nuclear weapons. We've already used them twice, right? So this is not something that's never happened. It's something that's happened, which should indicate that it can happen again.

SARAH HANSEN: I'm Sarah Hansen. And in this first episode of season 4, we're talking about course*8.S271 Nuclear Weapons: History and Future Prospects,* as well as the MIT Nuclear Weapons Education Project, which is a collection of open materials for lectures and discussions about what nuclear weapons are and their effects.

So why is MIT teaching about nuclear weapons? And why is it important that people like you and me know about them? To help explain all this, I sat down with two of the course instructors-- one a physicist and the other a policy expert.

BOB REDWINE: There are still thousands and thousands of nuclear weapons deployed by the major powers. And the use of even a very small fraction of them would frankly end life as we know it on Earth. It would end life. But the idea was to try to bring this issue that we think is existential to the attention of young MIT students, both undergraduates and graduate students, to get them interested in it and working to continue the efforts that had been going on at MIT to try to get rid of nuclear weapons. That was our motivation.

SARAH HANSEN: That's Bob Redwine, MIT emeritus professor of physics and contributor to the MIT Nuclear Weapons Education Project.

BOB REDWINE: In 1939, the first controlled nuclear action took place. And this was a real revelation, in many ways, to scientists in Europe and the United States. There was a lot of worry among scientists. One fear that became very real to many scientists was that Hitler and the Nazis would get access to this huge energy release that we now know as nuclear weapons before the Allies during the second world war. So there was a big push to have the Allies develop nuclear weapons in case the Nazis were going to develop them first. And that was what led to the Manhattan Project that eventually led to the two explosions in Japan.

[AUDIO PLAYBACK]

- Correspondents at air headquarters on Guam say there is reason to believe that the Japanese city of Hiroshima, approximately the size of Memphis, or Seattle, or Rochester, New York, no longer exists.

[END PLAYBACK]

SARAH HANSEN: On August 6, 1945, the United States dropped a nuclear bomb on the Japanese city of Hiroshima. Three days later, on August 9, a second bomb was dropped, this time on the city of Nagasaki. Hundreds of thousands of people were killed. It was total destruction. It's been nearly 80 years since these attacks, which remain the only use of nuclear weapons in armed conflict. Even so, following the bombing of Japan, many, many more nuclear arms were created by the United States and the Soviet Union.

JIM WALSH: The planet fundamentally changed in the summer of 1945.

SARAH HANSEN: That's Jim Walsh, senior research associate at the MIT Security Studies Program.

JIM WALSH: We invented this awful technology. And then our chief adversary, the Soviet Union, who we thought was trying to take over the world, they got it, too. Our first impulse was to build, and build, and build, and build, both sides approaching something like 80,000 total nuclear weapons between the two sides. As Carl Sagan said, it was like two people sitting in a basement filled with gasoline. One had 7,000 matches. One had 8,000. They argued over who had more matches.

What happened was, for the first time in human history, for the first time in planetary history, humans built a technology that could destroy everything on Earth. There are many challenges that we face that could pose an extinction threat-- climate change and other things-- that will play out over time. But the only way the planet dies in 30 minutes or less today is if some man who has control of thousands of nuclear weapons decides today is the day.

SARAH HANSEN: Jim explained some of the ways that the course goes beyond the basic physical science of nuclear weapons. He highlighted the cultural, political, and psychological implications of their existence and how, for a long time, the fact that countries like the US and the Soviet Union were stockpiling nuclear weapons was of great concern to people all over the globe. Both Jim and Bob remember the days when nuclear Armageddon was one of the most common fears of the general public.

BOB REDWINE: I can remember, in grade school, we used to have regular air raid drills, where suddenly the alarm would go off. And you would be told to rush out into the corridor between classrooms and put your head between your knees up against the wall until you were told to stop. And it's not obvious how much good that would do during a nuclear explosion. But that was what the country was accustomed to doing during the Second World War.

SARAH HANSEN: And this tension of living in fear of nuclear weapons came to a peak in the 1960s during the Cuban missile crisis, when the US government warned of a potential nuclear attack by the Soviet Union from Cuba.

BOB REDWINE: I happened to be in high school a few miles away from Washington DC in northern Virginia. There was a time, like on the order of a week or two, when we weren't sure exactly what was going to happen. Washington DC was clearly a possible target for such nuclear weapons. It was frankly terrifying. We thought today might be the last day of our lives.

SARAH HANSEN: Jim explained that this fear, the thought of nuclear attacks and global extinction, eventually led to action.

JIM WALSH: At least two periods in global history, in the late 1950s and again in the mid 1980s, citizens and governments were sufficiently scared that they made changes. They actually destroyed the nuclear weapons they built. They put themselves on a path where things were safer rather than more dangerous.

SARAH HANSEN: But this progress, while meaningful, was short-lived.

JIM WALSH: Then the end of the Cold War came and we sort of all forgot about it.

SARAH HANSEN: But as Bob went on to explain, the threat hasn't disappeared. If anything, it's increased.

BOB REDWINE: There are currently many thousands of nuclear weapons deployed. As I think many of you know, the power of typical deployed nuclear weapons now on average is much greater than it was in Hiroshima and Nagasaki. If you had one of these powerful nuclear weapons exploding, let's say, at a city, there would be enormous physical destruction. It was enormous in Hiroshima and Nagasaki. It would be even more and many, many hundreds of thousands of people killed.

There would also be a huge radiation problem that would spread much beyond the initial destruction site that would kill, in a reasonably short time, many more people from the radiation. And in addition, there would be a serious long-term radiation and climate change issue spreading around the Earth from this explosion over the months and years following that explosion. That's if there were just one explosion. If we had 20 to 50 explosions of this sort anywhere on Earth, it would basically end life as we know it on Earth. And we've got thousands of weapons deployed and ready to go.

JIM WALSH: I often hear people say, I can't imagine that nuclear weapons would ever be used because it's a mutual suicide pact. Yeah, well, it's important to remember we use nuclear weapons. We've already used them twice. As a political scientist who studies deterrence and the possible deployment of nuclear weapons, let me remind listeners it's been US policy to use nuclear weapons first in a normal, conventional conflict throughout the decades of the Cold War.

Just as we fret today that Russia might introduce nuclear weapons because they're losing a conventional war-- a war of tanks, and artillery, and that sort of thing-- that was the US doctrine. So all during the Cold War, the US doctrine was the Soviets had more tanks and stuff than we did along the European front. We didn't have enough men and arms to repel a massive invasion. So if they invaded us with their tanks and guns and we started to lose, we'd use nuclear weapons. That is our policy.

The current policy of the United States, its current nuclear doctrine is counterforce. It's not mutually assured destruction. It's that we're going to hit you first and try to take out all your nuclear weapons so that you don't hit us-- an incredibly dangerous and destabilizing policy. It's not I'll hit you back if you hit me. It's I'm coming after you because I think I can get you first.

So imagine how the adversary feels in that. These are just simple human beings, like you and me. It's not like the human race has matured and is suddenly wiser just because we happened to invent something that could kill everything. No, we basically shoved that technology into our normal way of thinking about things. We built tons and tons of nuclear weapons. They did the same. We had lots of tests. They did the same because it was considered a normal instrument in a fight between two adversaries with the occasional second thought-- oh my god, are we on the verge of killing everything?

SARAH HANSEN: While all of this is terrifying, it's also why the MIT Nuclear Weapons Education Project and the course 8.S271 were created and why they're shared on MIT OpenCourseWare. The more we understand nuclear weapons and their effects, the better equipped we'll be to advocate for their dismantlement. Much of the course is built around class discussion. The instructors focus on developing students' understanding of the technology and the political context in which decisions about the technology are being made.

JIM WALSH: Nuclear weapons is a topic that invites an interdisciplinary approach. When we try to understand the choices that humans have made about nuclear weapons, we need to understand what are their political interests, what's the nature of the international competition they find themselves in. What about bureaucratic battles?

I think morally it's a pretty easy decision. I don't think anyone ever has or will have the right to extinguish life on Earth. I don't think any human has it. But as a policy matter, I can imagine there are debates. And so for example, if Russia uses nuclear weapons in Ukraine, should the US respond with nuclear weapons? And I would say the majority of the class said, no, we shouldn't use nuclear weapons because Russia does. And I'd be inclined to agree with that.

But let's be honest. Let's say we don't. Does that encourage Russia to use them a second time? Does it send a message to other countries that they can use nuclear weapons with impunity? Very few of these choices in the nuclear domain are without tradeoffs and challenges. And so we have to be honest about that as we teach the course and let students put their chips on what they think is the best path forward.

SARAH HANSEN: And herein lies maybe the most important aspect of the course, showing students and really all of us that we do have a say in our future with nuclear weapons.

BOB REDWINE: I think we collectively as humans have no choice but to try to get rid of all nuclear weapons because as we discussed, they do pose such an existential threat. It's not easy, given the current situation. I think we have to do the best we can to educate people who are not experts about the dangers and to encourage them to vote and to influence their leaders in the right direction.

JIM WALSH: Anyone under the age of 50 has not lived a minute, not 60 seconds in a world where all around them the most important issue of the day was nuclear weapons. You've never experienced that. For decades, we've been told it's the government's job, as if the governments that own nuclear weapons are going to get rid of their own unless they're pushed. Not likely!

But when you say that for decade after decade and the memory fades, then you find yourself in the position we are today. Everyone thinks it's a terrible problem. No one thinks they can do anything about it. And that is a problem in their heads. The only thing that prevents us from doing it is the decision we make.

And so if we make a different decision, then we'll get a different outcome. But that's the challenge. It's the-- it's the psychological challenge that's the toughest when it comes to nuclear weapons. And that's why it's important to remember that we've had success and we can be successful again.

SARAH HANSEN: If you're interested in teaching or learning with materials from the MIT Nuclear Weapons Education Project or from the course *8.S271 Nuclear Weapons: History and Future Prospects,* please visit our website at ocw.mit.edu. You'll find all the materials there. And as always, they're free and licensed for adaptation.

You can help others find the materials too by subscribing to the podcast and leaving us a rating and review. If you enjoyed this episode, you might also want to check out our episode from season 1 of *Chalk Radio,* "Nuclear Gets Personal with Professor Michael Short." Near the end of the episode, Professor Short answers nuclear science questions posed by OpenCourseWare users.

Until next time, signing off from Cambridge, Massachusetts, I'm your host, Sarah Hansen, from MIT OpenCourseWare. MIT *Chalk Radio's* producers include myself, Brett Paci, and Dave Lishanksy. Show notes for the episode were written by Peter Chipman. The *8.S271 Nuclear Weapons: History and Future Prospects* and the MIT Nuclear Weapons Education Project online publications were shared on MIT OpenCourseWare by Eliz DeRienzo. We're funded by MIT Open Learning and supporters like you.

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