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A Dangerous Secret That Could End Fracking

Journalist Justin Nobel (left) and citizen activist Carrie Hahn (right) take samples of soil believed to be contaminated with radioactive elements unearthed by fracking. © Joshua B. Pribanic for Public Herald

by Joshua B. Pribanic and Justin Nobel for Public Herald
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Investigative Journalists Justin Nobel and Joshua Pribanic come together in this explosive podcast to discuss one of the hottest topics to come out of fossil fuels.
The idea of “safe” fracking transformed oil and gas in America for the 21st century and helped create a worldwide resurgence for an otherwise dying industry. But as we hear in this episode of newsCOUP, a dangerous secret protected by regulators threatens the identity of fracking. That secret takes us down a rabbit hole from the beginning of time to the present-day legacy of untold radioactive risks in communities wherever black shale is fracked.

Joshua Pribanic: Well Justin, welcome to the newsCOUP world.

Justin Nobel: It is awesome to be here Joshua, thank you very much.

JP: Yeah. So tell us about what it is that you're seeing and what it is that you're finding about radiation and oil and gas.

JN: Yes, so I feel that to understand the gravity of this topic, to understand how big it is, you really have to start at the beginning and I actually mean the real beginning – the beginning of time. The universe is what, nine billion years old?

JP: I think we can go with that.

JN: Yeah, nine billion years old. Earth is like 4.7. So early on, you had quite a lot of radioactive elements. In the early time of earth there were hundreds of radioactive elements, and it has been 4.5 – 5 billion years since those times so a lot of them have decayed out into stable elements. So, zoom back to the beginning– a lot of radioactivity on the earth. Fast forward to our present time – not that much, but still a fair bit. So what's left? What's left are the radioactive elements which have very very long half lives. All the ones with short half lives decayed out, which just means that they shot a bunch of radiation out and then became something a little bit more stable over and over again and eventually became a stable element which means they're not going anywhere for the rest of time. Which is an extraordinary thought. But the ones with long half lives, they are still around because they haven't had enough time even though the earth's been around for billions of years, they haven't had enough time to completely decay out into something stable. So there are two prominent elements that come up in oil and gas that started at the beginning of time as radioactive and they haven't had enough time to decay out into something stable and those are Uranium 228 and Thorium 232.

JP: [3:04] So we started in a world built on some kind of radioactive template, just boiling around. building and building. And from there we go from nine billion years getting closer to evolution and in that world we're getting the oil and gas mixed with this radioactive world?

JN: Sort of. So you have this idea that you have elements leftover that are still there, these little gifts from the beginning of time. How did they get to oil and gas? Well, the mother-load of all oil and gas is what's called the black shale. A black shale forms in shallow marine environments where you have organic, rich material being deposited. So imagine the Gulf of Mexico. That's a perfect example. Somewhere off the mouth of the Mississippi, and in various parts of the Gulf you'll be forming black shales that if you go through the processes of time, they get covered with other sediments, pressurized as they're covered enough where they're going to be at pressure, they're going to be cooked as they go further down, and eventually what's settling out in the Gulf of Mexico right now will become an oil or gas layer that some future civilization could crack up. But also, in that organic, rich material, the black shale, black being organic, you're going to be accumulating Uranium 238 and Thorium 232. This was kind of the first rabbit hole, the first part of the rabbit hole to recognize, you know, you hear radioactivity come up in fracking, fracking waste is radioactive, the brine is radioactive, and the cuttings. But this doesn't connect the picture, you've got to go back and think, "well where did it come from?" Black shales are inherently radioactive. Uranium loves to cling to organic materials so when you settle out stuff at the bottom of the ocean, you have already Uranium clinging to the dead marine algae that in the future will be cooked into oil and gas. It is baked in from the beginning. Geologists don't like when I use that analogy because "baked" has a certain connotation, but I described it to you the other day like you have the batter with the chocolate chips and that's your radioactivity and when you put it in the oven to make the oil and gas, to make the cookie, it's there. So there's no

“oh well it’s not there” and trying to get around it. And that is what’s amazing. You go back to these early USGS papers from the 1960s – there’s an incredible one that looks at the content of Uranium and oil in marine black shales, a 1960 USGS paper done for the Atomic Energy Commission. They weren’t even really looking so much at the oil, they were looking at black shales as a repository for Uranium. They thought that there was so much Uranium in these black shales, can we mine them successfully. And the oil was kind of this interesting afterthought and of course right now we’re fracking black shales for oil and pretending that Uranium doesn’t exist. But if you go back 60 years the scientists were all excited, because this is the atomic era and they’re thinking “wow there could be a lot of Uranium there.” And they actually come up with figures: there’s a great quote I have in the presentation I just gave: they reckon there’s billions of tons of uranium in the black shales, and it’s an astonishing figure how much Uranium is down there.

JP: [7:04] And the Earth has protected us mammals that way, right? Because this black shale that contains all this radioactive material which inherently is going to be harmful for us because we just can’t withstand it, has been buried 10,000 feet down in the Marcellus Shale and in the Utica Shale, so you know, we’re not being exposed to it prior to fracking, essentially, in this way. We see some of it with what, the Manhattan Project, or with other Uranium mine projects that are going on, but nothing on the scale of what we’re looking at with unconventional drilling. Is that right?

JN: Yeah, essentially that’s right. There is a recent source I’ve been led to who laid it out in a very powerful way: What we’re doing is taking a radioactive repository and bringing it into the biosphere. We’re creating a kind of subway system with oil and gas wells for transferring radioactivity into the biosphere. So exactly like you said, from a zone where it wasn’t affecting us to the zone where we happen to live as human beings.

JP: How did all of our scientists and all of our researchers, how did we not have this discussion until 2019?

JN: That’s a question for a sociologist, or the people to answer.

JP: We really should have asked that. How did we bypass that for this long?

JN: So here’s another rabbit hole. What I do is I will read a paper starting with USGS ones written in 2011. There’s a really great 2011 USGS paper that talks about radioactivity in black shales and eastern shales such as the Marcellus. So okay, what is that citing? That goes back to the ’60s, what is that citing? Eventually you’re lead back to 1904 and the buck stops in 1904. That is the first paper that me and any other researcher (because I haven’t seen anything earlier) first paper on oil and gas radioactivity. It’s a very simple study in Petrolia, Ontario, Petriolia named after petroleum which I believe is a greco-roman word. So this is an early oil and gas producing province in southern Ontario. The scientist goes into a farmer’s field and says “Farmer Joe, can I check out your oil well? I got this interesting study to do. Crude oil is coming up, he traps it, runs it through some Erlenmeyer flask and sees there is gas that’s emanating out of the oil and using some sort of photographic plate is able to determine that it’s a radioactive gas. So this first study done in 1904 is called A Radioactive Gas Found in Crude Oil Petroleum. Radon hadn’t even been named yet, I think a couple years later radon was invented and given the name radon. The gas this scientist had found was radon. So that’s it. In 1904 they could have been like “okay, let’s hold a forum, let’s talk about this.” But now we know

radon to be the second leading cause of lung cancer deaths in the United States. It's an enormously successfully lethal

JP: 10:33 killer of humans.

JN: Yeah, and we can get to that in a bit why radon is so dangerous, but yeah you're right. This discussion could have happened at many points across history. I don't know why it didn't happen in 1904. I mean, if I was that scientist I would be waving that data as loud and high as I could.

JP: We don't know how this happened, but we do know now, finally, after quite a bit of research, quite a bit of reporting, and a lot of our own work, that this Marcellus shale and these shales that are being fracked, they are all hot. They're not just, as the industry might describe in a public meeting, that "hey it's okay, it's brine, but it's just a thimble-full of radiation in a giant pool the size of a lake." This radiation that's coming out the Marcellus shale is tremendously high, and in the reports we've put out at Public Herald, we've cited examples where the brine is being tested in order to go to a waste treatment plant and that brine is coming out with radium at like 5,000 pi/C per liter. And of course there's been tests that come out with brine radium at 20,000 pi/C per liter. And here is a substance that we consider to be unsafe at 5 pi/C per liter, so we're dealing with something that's 5,000 times larger in some cases, 1,000 times larger in some cases, whatever, higher than we consider safe for humans. Which is pretty dramatic. And we don't even have those trucks marked, and we don't have a discussion.

JN: Absolutely. There are three key things to riff off of that. One is yes, let's talk about the numbers. So, right, even our own EPA is so frightened by the element radium, we'll focus on one of the particular decay products of Uranium 238 and one of the particular radioactive elements common in oil and gas, its radium 226 or 228. So focus on radium, the EPA thinks radium is so dangerous that the limit in drinking water they've set is 5. 5 pi/C per liter. So we'll just focus on the number 5, no more than 5, it's bad stuff and you don't want any more than 5. The Nuclear Regulatory Commission, that's scary, think the Nuclear Industry they're serious people at the Nuclear Industry, they take their regulation pretty seriously. When they look at industrial effluent, that's industrial discharge, their limit is 120. So 5 for water, 120 for a factory, for some sort of industry, and yes brine in the Marcellus has been found to be as high as 28,500. So 5, 120, 28,500. One of the strongest sources, one of the strongest quotes, ways that I've been told to try and digest that is in the nuclear industry if you had a cup of brine taken from a Marcellus brine hauler, we see these trucks like you said unlabeled everyday, take that cup, transfer it into a nuclear facility where they have a lot of regulation, a lot of safety, workers are appropriately dressed and whatnot, and now you've got a cup of 28,500 pi/C radium brine and they spill it, it would be warning lights in the China Syndrome, the movie. They would shut the place down. If that worker accidentally took that cup home with them, they could go to jail. We are now allowing truckers who have no knowledge, no protection in a truck with no labeling driving around the country, driving around Pennsylvania, driving around small rural areas, spilling everywhere and we're spreading it intentionally on roads at that point, which is just catastrophic.

JP: 14:37 And then to go another layer on top of that we have a regulatory agency in all states that have done studies in some cases on this, and have somehow found levels that are much lower than what you and I have seen in these test results. The DEP own study ended up coming out and DEP was touting it as a study where they weren't finding any serious risks to the public

health and if they did they would shut everything down tomorrow and it wouldn't be a problem. So even though they're sitting there with data like you're describing, they're telling the public that there's no risk there for the radiation and there's nothing to be worried about. However, we have these brine trucks that you're describing going to landfills like we reported in August, dumping all that radiation into the landfill, and then we have the rain falling down pulling the radiation out, making it soluble, putting it into the leachate, leachate going to the sewage facility, the sewage facility unable to treat it which inevitably allows it to dumped back into the rivers. And we have a regulatory agency that basically says that this somehow isn't a risk. How is that even a reality? I mean in the work that you've done, which is going to be leagues beyond what our regulatory agencies have done, the health discoveries that you're finding in this, try and rationalize what the regulatory agency is saying versus what it is that you're reading.

JN: They haven't read everything. They're looking at, you know, imagine this as one of the pyramids in Egypt. It's a massive structure, it is giant and they're looking at like 6 bricks.

JP: So it's similar to other cases that we reported about DEP. The personnel at the regulatory agencies and the EPA also are presenting themselves as the foremost scientists at the forefront of these issues, or that they are the experts on these topics. But what we're finding out is that they're barely D students in biology 101 or any type of science class.

JN: That's a great point, and you all at Public Herald have been top notch at trumpeting this. In some of these studies there actually is very interesting data where if you understand the science, if you've read a lot, you'll be like "oh wow, that's high, and that's scary" but then the conclusion of the paper will be something very milk-toast "we'll we're not that worried and we've got it under control."

JP: They don't think there's an impact here.

JN: Exactly. So even within their reports where the conclusions are "it's all fine," there's information where if you've got your antennas up you should be quite worried. I use that in a lot of my reporting, but you're looking at an interesting aspect of a regulatory agency. I don't know why, I don't know when they dropped their guard down and dropped their courage or their sense of duty or why they say it's all okay. It's weird that they're not ringing the alarm bell. Why is it that a bunch of scrappy journalists are running around educating themselves on this, getting together, and really, at this point we have an all-star team of radiation experts that has been cherry-picked from nuclear industry, from the nuclear proliferation team, people who went around in the '80s and '90s to post soviet countries, or still during the Soviet era, and were looking at nuclear waste. I mean, the people I have known. This is what the regulatory agencies just don't understand. So one of the people I have now, he would go around to sites that were potentially making bomb grade material, or reprocessing nuclear material that was illegal under nuclear proliferation treaties, and he says: "I don't even have to go into these facilities. I can go outside and test the doormat and know exactly what's happening inside that facility just based on radionuclides I find on the doormat. So when you transfer that expertise to the Marcellus, this guy could track a worker through a diner and then back to his car and then to his home and then, looks into the pile where he dropped his clothes on the floor. We can do that. We have the science to do that. Radioactivity, as complicated as it is, as complex as it is, it leaves a million clues. That's the nature of it. It's breaking apart constantly and leaving clues of itself. Once you get a scientist who understands that, they can crack into that. And that has happened. This is really important to mention: okay well you don't have any proof that people are going to hear,

but we do. I showed you the book the other day. Case in the 1980s in the Mississippi oil fields where workers who are cleaning out a kind of radioactive scale, essentially think of your kitchen pipe that builds up gunk at certain points where pressure and temperature change, oil field piping is the same way. And the gunk that oil field piping builds up happens to be radioactive. If it's a pipe going from the formation up to the ground it's radium often that's building up as this scale. So these workers have to chisel this out. That piping can get so gunked up it can block off the flow of oil so you at some point have to unclog it, which means you have to take it out of the ground, sending it to a machine shop, and these guys in Mississippi were really talented machinists, they were successfully cleaning a very hard precipitated material that's tough to get out with these sort of self-invented, complicated, automatic chiseling tools. This type of work by the way, it's referred to as rattling yard work, or the rattling yard because it's so tough it shakes the equipment therefore creating all this dust that the workers breathe in, having no idea that their breathing in dust that's laced with radium. And they were getting sick and they had doctors at the time in Mississippi who looked at them and said: "Oh, this is weird. You have radium contamination." They found it in their bodies and then traced it back. And so there is a lawyer named Stuart Smith, he wrote a book called Crude Justice, which came out about six years ago, and he put this story together and he sued two of the big majors successfully.

JP: 21:43 So the decision in that case was "yes, these workers were contaminated with radium from the oil and gas industry and they have been sickened by it."

JN: Yeah, and it's such a strong pathway. They were doing this work in the backyard, it was a real backyard operation, and one of the workers wives had a vegetable garden adjacent to where they were cleaning the pipes. The garden vegetables were coated with radium dust. She ate the vegetables, she was six months pregnant, sat on the side of the bathtub one day and her hip cracked in half. Her bones weakened because they were filled with radium. Radium is what's called a "bone-seeker." It goes to your bones. Your body thinks it's calcium. It has a similar chemical makeup as calcium. If you swallow radium, if you breathe in radium,

JP: Through dust

JN: Yeah. Radium sticks to dust. It can stick to clay. Dust is the worst exposure.

JP: So outside of the immediate most serious risk of all of this which is definitely going to be the worker on site who is being exposed to it through machinery, through the cleanup, through the day-to-day process at an unconventional well, and even at the conventional wells. One of the first real dangers to the public is the dust from these oil and gas operations either through the well pad itself and what it's spewing into the air, which is a potential for this dust to be carried and moved around, or what we've seen with someone like Siri Lawson who helped blow the case up of is the spraying of dirt roads with salt and brine fluid a safe way to deal with dust control. Right? Which is the most ironic, ridiculous situation where they're attempting to control dust with salt water by spraying it on the rural roads in Pennsylvania next to Siri Lawson's house using brine that they're saying isn't a problem, but Siri is saying this is unsafe, I'm sick, there's all these problems. We're saying, yes, there's radiation in it and it doesn't even at the end of the day, to stop the dust from happening, it just ends up creating more dust because it dries quickly. And then that dust is now radioactive. So one of the first ways that I think a lot of people have been exposed to this is just simply through dust control and spreading these fluids on the roads in rural PA.

JN: Yes. So many important points there. Before I get into it, try and imagine a bunch of chainsaws running, somehow running together like some inventor has put eight chainsaws together all pointing in different directions and your trying to wrap a wet handkerchief around it and somehow contain it. That's this.

JP: That's the level of risk that we're dealing with. And none of us can really wrap our heads around it. It's a hard thing to consider – the exposure to radiation. So maybe we can just walk through that a little bit. How big is the risk and where does it start for the people and families in Pennsylvania because of something like fracking?

JN: At the wellhead, we don't really know what's happening because the industry has been very resistant to any sort of testing. So that 1904 study, a very simple study done 115 years ago, I don't think that has been able to be reproduced. I would love to know, and many people would love to know how much radon is coming up at the wellhead. That would help answer a lot of questions. When you flare at a wellhead, when your flaring methane which happens in a lot in certain places like North Dakota, the Permian, and you see it in the Marcellus, too, are there also worrisome amounts of this second-leading-cause-of-lung-cancer radioactive gas radon being released in these flares, I don't know. If we knew, how much radon was coming up we could start to answer those questions and then tell people who live in valleys where maybe they're surrounded by like six or seven fracking wells, their on the hill, all this flaring is happening, maybe there's a compressor station, too, which has an enormous amount of flaring often, radon is a heavy gas that settles down – so you can imagine what could be happening there. So we're trying to put together these pieces and we will eventually, we will get there. Once we start to get these experts in there these questions will be answered, but because certain data routes are cut off, it's hard to say the exposure at the welded. But knowing the science, there is a lot of room for concern.

JP: Our experts right now, we don't even have them testing for the radon and for the radiation. So we're still not there.

JN: Right. You and I are doing the job (which makes it so interesting as a journalist), like you figure out what's happening and suddenly you have to go beyond being a journalist and I know you're doing this too. We're calling the scientists and saying "hey, you've got to check this out. I know you're busy but you get this and I don't, you have the equipment and I don't, let's go here." And then we're talking to the health researchers as well, and oncology nurses or different people in the environmental toxicology field, they don't know this, they're not out in the field as much as us, and trying to bring them into the picture. But to answer the other part of your question, radon is what's called an alpha emitter. So again this idea of radiation is a piece of material that's constantly breaking off pieces of itself, ejecting pieces of itself, and that is the radiation. It shoots off a piece of itself and it actually becomes another element which is an extraordinary process. So it can shoot off gamma rays, or it can shoot off a beta particle or it can shoot off an alpha particle and an alpha particle is what ends up being really worrisome for a human being. Our skin or a piece of paper can stop an alpha particle, but our gut, the soft lining of our gut, our lung tissue cannot. So if you swallow something like radon, which is an alpha emitter, it's gonna do this blast-out inside your body. That blast-out is energy essentially and so there's a good analogy I've been running with on what do you mean you shallow radon and it shoots an alpha, what is an alpha? An alpha is just an extraordinary little particle, it travels at a 10th of the speed of light and it has so much energy that, imagine a drunk driver on a city street that's lined with cars. The driver is going way too fast and they smash into one car and then they

ricochet maybe into a second car and if they're really going fast maybe they'll hit a third and fourth car, and then their energy's gone. They're going sixty, but then they hit a bunch of cars and they're done. Focus on the cars. Four cars were hit. An alpha will do that 10,000 times. That's how much energy it has. 10,000 ricochets. And it's happening inside your cell, so 10,000 ricochets and your cell is obliterated. It is absolutely macerated. And that is just one alpha particle. We do know, many experts I've talked to have confirmed this, one alpha particle can cause a lethal tumor. It's astonishing. But that tumor will not happen sometimes for 10, 15, 20, 30, years which is part of the reason it's hard to say "look, this happened yesterday." It's not like that, it's more like "Look, this happened but it could have been 20 years ago. We're in the early part of that twenty years right now with fracking at least.

JP: 30:22 And the alpha particles that we're looking at, if we're inside of that space where there is 5,000 pi/C per liter or 20,000 pi/C per liter in that tank then how much are we considering then with alpha particles and numbers? How much is going out there? It's so much.

JN: The industry will say "well there is ongoing radiation everywhere." True, but it's worrisome even that we live on a planet that is that radioactive that some of us will die from that. But we've now introduced much, much more. By the way, radon doesn't stop there. Radon will go through five decays in about the space of an hour.

JP: And this part is fascinating. This is the part that none of us has really been clear on which is radon is always the end point like "Oh no, radon is coming. Stop radon." But beyond radon, there is a whole other series of these daughter products that are created, right? It's not the end of the chemical reaction.

JN: No, not at all. Radon is right about in the middle of the Uranium 238 decay chain. So radon has a half life of about 3.8 days and again a half life is the time it takes for about half of it to decay onto the next thing. So at 3.8 days, about half of radon will have decayed, which means sent out this enormous blast of energy, you know 10,000 smashed up cars, and if it's in your cell, pieces of your cell. So after radon starts its decay, it goes boom. It blasts out the alpha and it's Polonium 218. Then boom, it blasts out another alpha and it becomes Lead 214. Only Lead 214 for about 27 minutes. Then it blasts out a beta and it's Bismuth 214. Blasts out another beta – Polonium 214 for a fraction of a second. Blasts out another alpha and then its Lead 210. So that's five decays in an hour and three of them were alpha decays. That all happened in your lungs. So if one alpha can cause a lethal tumor, you just had three opportunities to cause a lethal tumor. Sure, our body can repair that. It will find it, repair it, but you're starting to play with odds and it's not done yet though. Now you have Lead 210. Radioactive lead sitting in your lungs, or dislodged and sent into your bloodstream, and the decay will continue from there. But for 22 years, you're going to have radioactive lead in your lungs.

JP: So this is part of the thing that we stressed to the Attorney General's team when we spoke to them in 2017. We said "Listen, the Department of Environmental Protection understands that there is radiation inside of this process, they understand that there is radiation in the brine, they understand that the radiation gets caked into the machinery and has to go to the landfills. But they also understand that if there is contamination, or potential contamination to someone's water supply, that the existence of radiation would be one of the easiest ways to trace and connect that to fracking because we would be able to measure in simple numbers, "Oh, the radium has increased. All of these products, all of these parts of that chain reaction that you just named, which there are almost a dozen of those different parts that happen outside of Uranium

and Thorium. All of these things the DEP can test for. And knowing that, knowing that it would help them trace a conclusion in the end, and knowing that it is one of the scariest health concerns in the entire fracking process that everybody should be worried about, they are refusing to test for the radiation when they are going out and doing these investigations. It's not that they've never done it. They've done it before. They've found the radiation inside of these peoples drinking water supplies, but the conclusions that they're making are not being based on this radiation.

JN: 34:38 Yeah, and they're not even digesting the full part of the decay chain. So here's a test that is not that difficult, that once you understand the decay chain you could carry out with a couple students or workers, officials, or any group of able bodied people anywhere you are worried about radon being emitted, if you think about that decay chain you realize "Oh wow, in an hour your not going to have radon anymore you're going to have radioactive lead. Radioactive lead can be examined just like any metallic isotope can be examined. So you go to an area, say its a flare on a well pad, say it's a big tank that's filled with brine such as you might have at a frack waste treatment plant, you have radium. Radium goes to radon, radon goes up in the air and an hour later, on average, you have radioactive lead. Which will literally fall out on its own, or fall out with precipitation. There are many papers about how Lead 210 falls out over the earth. It's interesting. So what you do is test around that spot. You and I were talking about earlier the exact way, there's patterns that help scientists know how to look for something, you can test in a certain pattern and that's it. You can test around and see are the numbers of radioactive lead higher downwind during a certain pattern connected to a well head, a compressor station, a frack waste cleaning plant, and this is the research I'm trying to bring out and trying to get researchers to do. It's not that difficult. It's interesting. It involves chucking everything onto an RGIS map or some sort of map, and with a citizen science team you could canvas the whole Marcellus and do a very interesting study. I would love to see that.

JP: That's astounding.

JN: Absolutely. The DEP could do this.

JP: They've done some of this right? I mean they've done the radiation study. They know as an agency, they have an understanding that the process is radioactive. What they're trying to convey to the public is that it's not a worry to you because the radiation is not getting into your life. Your not being exposed to it. And that's the kind of false security their handing off to different people in the public right now. And for us, were looking at it and saying "How is it ever possible that you came up with this conclusion because we just sent you an email to your team at the DEP office because we know that a truck just spilled over in Elizabeth Township, and we asked you did you test the brine from that brine for radiation and you're telling us that you're going out and your doing these inspections and you're looking at these spills and your not testing any of them for radiation at all." We have people in the fluid.

JN: Right. Great for you to bring it right there. You are so good at doing that at Public Herald. So, right. Brine truck spills. We know there's arsenic, we know there's other things in the brine, but, yeah, there's radium. How did you not test for radium? Brine trucks are spilling regularly because the drivers are often going on these hilly, icy, Appalachia roads they don't know. These trucks crash all the time. There are spills everywhere. I don't even know if DEP is marking where all the spills occur. But everywhere you have a brine truck spill you have a small radioactive spill.

JP: And this is one thing that we tried to really help the Attorney General understand, that the DEP is creating a genre of what they consider primary chemicals of concern and they're not only not testing for radiation in that genre, but they're excluding it as if it doesn't exist. And you and I, we look at a pollution event and the primary chemical of concern, the one at the very top, we're looking for radiation at the very top and we're asking "How much was there? What got spilled? What's potentially in the person's water? Oh, why didn't the state test for any of that stuff?" So we then have to find a scientist to go out and do all the testing for us and that's the position we've been put into right now and it's a position I think proves some intent at the Department of Environmental Protection's office. There is an intent there NOT to test for the radiation. So the question is really getting down to why. And the one person that we've seen try to dismiss the real safety issues surrounding radiation and surrounding oil and gas in general, has been Scott Perry. Somebody who shows up at events, gives speeches, answers people's questions and concerns about this, says to them "Oh, Public Herald's publishing news that can't be trusted." Meanwhile our news [Public Herald] is just taking their [DEP] documents and reinserting them in the public eye in a way that's helpful for people to understand. Or he's telling people "Listen, we can't answer those questions because someone is trying to put us in jail under false pretenses, with respect to the Attorney General's office. So we have people at the DEP who understand this.

JN: 40:09 I think some of them do, and some of them, again it is complicated, I've been reading it and interviewing the best people I can find on it for 18 months now and I don't think someone like Scott Perry has done that. I've talked to Scott Perry a little bit on the radioactivity issue but not much and I doubt he's read the literally hundreds of papers that I've read. I don't think most regulators have. So I think the mind just wants to not see the ship, or maybe a UFO would be a better example. You know, this strange thing in the sky and your eyes just can't see the thing they think it is and they walk away from it. But some of them know and the aim over the next year, I plan to and do think I'll be successful in getting more whistleblowers about the DEP and the EPA. I have some leads in both of these agencies that know and that are scared and know that there is a major problem occurring. But they're not talking right now, but I do think they will eventually.

JP: I think that takes us to one of the worst case scenarios for this situation and for us, I believe that is environmental health and human health, where the neglect of something as important as radioactivity ends up being so much that we end up with a catastrophic problem inside of the ecosystem, right, and where there is an issue with radiation in an ecosystem, like something similar to what we heard from Guy Kruppa in the sewage plant story where all the bugs are dying, all the bacteria is dying inside of the plant and they're trying to find out why and all of a sudden they're finding radiation in the leachate and that kind of thing. The other really, really, scary, scary story is the potential cancer cluster in an area. That is the dark doomsday situation that we don't want ever. We're writing about a situation where the neglect has been so high that there has been a potential group of people who have been exposed to high amounts of that radiation and they then, could be suffering serious health effects: deaths in relation to being exposed to it. That is really scary because now, we have this cancer cluster happening in southwest PA and no one knows why but we know there's a potential risk for radiation down there.

JN: Many ways to go with that. Again, the science is there. Radioactivity may be complicated but it leaves a trail. So if you do ingest radium for example, it's a bone seeker, it goes to the

bones. Radium 226 has a half life of 1,600 years so if radium is building up in your bones, it's not going anywhere. You, the human, become a little test kit, it's there in your bones. If you could get at the bones you could know exactly what's in the bones at least. Because radium goes to the bone, it provides an incredible opportunity to understand how that particular radioactive element moves through the human body. There's this astonishing case, many people know about it, the case of the radium girls in the 19-teens, 1920s. Early days of radioactivity and people are very excited about it: "Oh, if we make this radium-laced paint it excites other metals in the paint and causes them to glow so if you paint it on a watch, different parts of the watch can glow." How great. So you have these women in these factories using the radium-laced paint, it's a cool job for them, a lot of them are artists, its the '20s, hip people, they've got the radium job and they stick the little brush in the radium paint, put it on the watch and then they stick it into their mouth to keep the tip firm. These women ingested not even gigantic amounts of radium, bit regularly over time every day. So they're ingesting radium and about 20% sticks in the bones, the body is able to excrete the other 80%, but that's still a good bit, 20% in their bones and they start dying. A couple years later some of them, but within the time span of 5-10 years, many of them died. Some of them died decades later but still their deaths were traced to radium. So how do we know? There's a medical examiner in Newark, New Jersey where one of these factories was located and he was a great scientist. He did autopsies on 18 of these women. He wrote a brilliant paper in the American Journal of Cancer published in 1931, and he, if you read this paper and I recommend anyone who wants to research this issue should, he has a diagram if each woman, a skeleton, 18 skeletons in the paper and he traces exactly where sarcomas developed. Sarcomas are these cancers that formed in specific bones in the radium girls and Martland even talks about why he thinks the bones that developed sarcomas got them. One of the exposure pathways he saw commonly was the jaw and a condition developed called necrosis of the jaw, what's now referred to a radium jaw, where the teeth in the lower jaw rot away. On the cause of death for many of the radium girls, necrosis of the jaw is actually listed. There are brine haulers I'm in touch with in Pennsylvania who have their teeth and lower jaw removed. We can't make this step yet to it being radium, because no one has done the testing to determine that or make that conclusion, but it is there to be done. So while we're on that, I know it's complicated, but imagine the radium girls: a poor woman dies of this exposure she was not protected against, so she's dead. She's a skeleton. Radium killed her and it's still in her bones and Harrison Martland lays out in this paper, in the year 3491, she is still so radioactive that her skeleton would be emitting thousands of alpha particles every second. 3491, deep in the future, she's still just streaming radioactivity out of her body. If the Industry or anyone wants to try and pretend that we're not going to solve this problem, we're going to solve it. I mean what are you going to do, cremate all of us while we're still alive? We're the test kits, its there. If you go to the CDC page on radium right now, until they take it down, there are tests for radium. Think of how complicated a test would be, like you break your ankle or something and you go in and suddenly your being thrown in a CT scan, this million dollar machine, no. Radium is pretty simple. It's a urine test and it's an exhalation test, and the exhalation test is scary because again, radium is a bone seeker, and the next decay after radium is radon which we've been talking about and it's a gas. So if you have radium in your bones, you will be venting radon out of your body and some of it will come out of your mouth and that can be tested. They can measure the amount of radon coming out of your mouth and make a calculation to determine the amount of radium in your bones. So the brine haulers I know that are sick and tried to get doctors to do this test, not a hard test relative to other tests that are done regularly in the medical field. No one. None has done this test. I have not been able to find one doctor in the United States of America who even knows about this test even though it's listed on a government webpage.

JP: It's astonishing. Especially for a place like Pennsylvania where the pathways of exposure could exist. We talked about that pathway in Triple Divide back in 2013, where we show how the industry was burying those waste pits of those drill cuttings which would be highly radioactive and containing all of that. These mini little landfills in peoples yards, where they dig it up and put a liner and then they just close it up like a teabag and bury it. And here we are in the film looking at one of these situations where they illegally bury it and all of a sudden radon is showing up in a person's water supply at really high amounts, like really high amounts, it's just shocking. It is a clear picture that this kind of thing had been happening very early on and the potential pathway of exposure was clear and real and dangerous and we still haven't been able to have a discussion about it until maybe 2020, I mean that's what we're shooting for. We're going to be going after this at Public Herald for the next year and going far beyond what we did with the sewage leachate story and the radioactivity at those landfills and really uncovering some things that are truly important and that will go further into that detail description that you see in Triple Divide where someone could be exposed through their shower or their water. For people who are listening and probably are scared about the uncertainty of it and not really knowing where to go with it beyond the books and research papers we cited earlier, the one thing that really helped me wrap my head around the dangerousness of the low-level radioactivity was that documentary Atomic Homefront that came out on HBO in 2017 where you had a family in St. Louis, Missouri. These people are living next to the development of the atomic bomb where they were mining Uranium and processing it, and using it in this town. Then they created this landfill in this metropolitan area and next to it are these people. The landfill is so radioactive it's hot and burning and there's this underground fire burning and there are things leaking out and they're getting into the creeks and people are getting cancer, a lot of people are getting cancer. They're like "How is this connected? How are we getting cancer?" They're trying to figure it out. Eventually someone maps it out and they start to see that everyone getting cancer lives next to the creek. Then they find out "oh it was a creek contaminated by the Uranium processing and now the landfill's on fire and it's exposing us to the dust and exposing us to all these other risks. Why isn't the EPA coming in and doing anything about it? How are we supposed to get something done?" So they're fighting all these fights that are potentially going to be the fights of the future of fracking in a place like Pennsylvania. You see this fight in Atomic Homefront just play itself out. It's frightening to see but it's also really helpful to understand that there are very few studies on the health impacts of low-level radioactive waste. The few things that we're seeing are very scary and extremely important to get control of before we lose control of the entire situation.

JN: 52:09 Absolutely. That is a really great example I didn't know about until you led me to it, this case in St. Louis. They had piles of radioactive waste, uranium tailings, things like that, and they kind of dragged it around the city and it left a trail and so one pile of waste flooded by one spring flood going into one creek, and that creek, the next time it floods, goes into a basement and it worked. It brought the radioactivity in. You described it perfectly. Even in that case the US government, I'm forgetting if it was an EPA study or a ATSDR study, but they came out with a paper that I was just looking at, it was like a year or two ago, they even connected, they determined "Oh yeah, we looked at the science, we looked at the numbers," because a bunch of non-government researchers really cracked that case. The government just recently looked at it and they determined conclusively that those cancers that that community's experiencing are connected to that radioactivity. Which, again, we're talking about these regulators who are very hesitant to say anything and they made that jump there. So they're even on board with this. I think they know because with the science in front of them, that's laid out some really great work

by other researchers, they can't just deny it. Fast forward that into fracking, what are they going to do? We're starting to crack into it, we're finding the science.

JP: We're finding the landfills. We're finding that they're becoming hot. We're seeing the creeks that are being connected to it and how they potentially could be having these kinds of pathways of that radiation and carrying that trail. You're just looking at the future just unfolding in front of you and it's the Atomic Homefront for me all over again. Whether or not it's the same scale, it's the same substances and people inevitably are going to be in a situation very frighteningly similar to what we saw down there.

JN: It's like, how much knowledge do you want to have about your world? Do you want to think that the earth is the center of the universe and be really happy about that or do you want to think that maybe there's a bigger picture out there. You could just live in a town and say "Mary died of cancer, and Joe died of cancer and that's really sad," and people go and they go and not try and put the pieces together or you can try and put the pieces together and then you get the information that there are reasons behind why certain people are getting sick in certain places. I think the way the regulatory system has worked it has certainly encouraged people, enabled them to ignore what was happening right in front of their eyes. We have some great scientists who are courageous, who are willing to, to very much still following the code of science, examine and start to crack into this and then you're left with "ok, do I want to know that there is a specific reason that we're all getting sick or do I still kind of want to live in this world of naivety." I think we have a very important decision to make as a society because once you digest what is happening in the oil and gas industry with the radioactivity that is being brought to the surface in many different ways, spread, dumped, injected, emitted, into the air all across the US your left with we have to better understand our natural world and completely alter how we live and that is coming up in discussions about plastics and other materials, and that is good to see. That is where the conversation has to go. Do you want to keep breathing in things that are going to kill you or do you want to try and live in a way where you don't have to breathe in things that are going to kill you just to make energy.

JP: 56:10 And we're going to be covering that conversation very closely in 2020. We're extremely excited to have a chance to work with you and your knowledge on this issue and all the excellent work you've done. It's been half a decade of us crossing paths, but being able to align on this issue of radioactivity is really exciting. We're going to be talking to the scientists and understanding from them what they're discovering and digging further and further into the story. So 2020 at Public Herald is going to be a big year on this. So follow newsCOUP, follow us closely because we definitely have a lot more we want to say.

JN: Absolutely. And I am so excited for this connection, Joshua. I want to say before we sign off: You all have really cracked into the leachate issue and you've laid it out in your work, but to quickly lay it out over the air, and then lead to how my work can expand on that. You produce not just brine, this liquid that is down in the formation with any oil and gas, more brine comes up at a well than oil and gas. A good estimate is 7 barrels of brine to one barrel of oil. So brine is the byproduct, and brine can be quite radioactive, sure, but in fracking because you are drilling horizontally through the black shale, and again, you remember from the first part of the talk, black shale, motherlode of oil and gas, can often be quite radioactive. USGS has known that for 60 years. The Marcellus happens to be extraordinarily radioactive. So if you dig up a bunch of dirt out of the Marcellus, out of the black shale that is the Marcellus, called drill cuttings, that can have quite a high signature. These drill cuttings are being brought in trucks to these

municipal landfills meant for diapers and very light industrial waste, certainly not this type of material, and piled up in extraordinary amounts. We're talking about landfills, you and I have been to some of these communities, people have told me "the landfill started out in the valley," people throw the stuff in a low spot. Now these landfills in some places, in a region of hills like south west Pennsylvania, are the highest geographic feature in the region. Nature doesn't grow that quick. In 10 years these things have grown to literal mountains. One which hopefully we'll visit tomorrow, it's called Mount Arden – Arden Landfill, the locals call it Mount Arden. It's an astonishing sight. It looks like the fake ski hill they built at the mall in Saudi Arabia, you can tell humans built it because it is not beautiful. Anyways, these landfills, all these drill cuttings, they have a radioactive signature. The drill cuttings have been analyzed much less than the brine, so we've got to do a lot of guesswork. The drill cuttings are going to have Uranium because you're taking the rock itself, whereas the brine, radium flows better with water, than Uranium although uranium can be soluble and flow with water, the drill cuttings can have the whole mix of the decay chain, all the way from the top to the bottom. No one's really analyzed it well. We're piling them in these mountains. It rains on the landfill, a lot of liquids still in that material anyways so you get what's called leachate, this gunky water that settles at the bottom of a landfill and landfills have intentionally anticipated this so they have different pipes to take this leachate somewhere. So where do they take it? They take it to the sewage treatment plant. And this is what your work is shown. These sewage treatment plants have no ability to clean a lot of the stuff in the leachate and especially the radioactivity. No ability at a sewage treatment plant to clean out radium and these other radionuclides. Not only is it gunking up the plants it's being injected into these rivers. So where is it going? How much? Where is it settling? How many landfills? These are the kind of things we'll look into. So how can all this happen in the first place? How can you take a truck of drill cuttings or brine loaded with radioactivity, put it on the road, do whatever you want with it – one just extraordinary loophole, this was just another complete mind-blow, the Halliburton loophole, so many exemptions that the oil and gas industry has created for themselves. The mother of all exemptionings is actually under a law that was passed in the 1970s the Resource Conservation Recovery Act or what's known as RCRA. RCRA is a great idea, it's says we're going to produce industrial waste, some of it's going to be quite hazardous, to be a country we have to have some industrial waste being produced. But we're going to track it from cradle to grave, we're going to look at all our waste and we're going to designate the waste that is the most worrisome, the most dangerous for humans, we're going to use an official word: Hazardous. The hazardous waste has to go in a certain kind of vehicle, the person who operates that vehicle will then therefore need appropriate training, appropriate equipment to handle the waste. It will even have to travel on roads. Have you ever driven under a bridge and there's signs saying a certain type of truck aren't allowed? Those are often trucks with hazard placards, hazmat trucks. We think very thoroughly about this designation of hazardous materials. Then it will have to be buried, its final destination, the grave, in a certain type of landfill. Okay, so it's a good idea. Take hazardous waste but it's going to be appropriately disposed of away from humans, you'd think. Well guess what industry got a glaring, massive exemption from this: the oil and gas industry. So all waste, the sludge, the scale, the drill cuttings, the produced water, that come up at an oil and gas well are, according to RCRA, they're not hazardous. And what's so amazing and horrific really is the EPA was forced, by some lawsuits brought by environmental groups in the early '80s, they were forced to reexamine RCRA and to look at this designation and see if it was appropriate. So the EPA does this, it took them a long time, that's why these lawsuits came about because they were taking too long to do this reanalysis. This is something that industry often does, or legislators do when they're creating a bill that they know is going to affect industry, they'll leave a loophole and say "well, we're going to look at it in two years." And that means that for those two years, industry can do

what it wants. By the Tim the people, the regulators, look at it, industry is moving full speed ahead. By the time the EPA looked at this really dangerous loophole, the actually determined "oh wow, oil and gas waste it has uranium, it has arsenic, it has lead, it's just loaded with really toxic stuff. It is technically quite hazardous. But if we were to label oil and gas waste as hazardous, we would actually potentially shut down this industry, we would have so much waste that we don't even have enough landfills to deal with it and we don't even have enough regulators to regulate it. This is there in a 1988 EPA document that didn't get nearly enough air time. By EPA's own analysis, to label oil and gas waste as hazardous as it should be labeled, would crash the industry. We can't crash the industry of course so therefore we're going to have to call it non hazardous. Because of that it can go in a truck that looks like a septic truck with no warning signs on it, one little word on it that says brine maybe or maybe it says water, they could graffiti their fiancé's name on it, it doesn't matter. You don't need anything, no placards, the driver has no idea they're carrying a dangerous material, a radioactive material, and it goes in a household landfill meant for diapers. And that's it. If you were to change RCRA tomorrow, and declare that oil and gas waste instead of being non hazardous, was appropriately labeled hazardous, 6,000 different pieces of the industry would explode and grind to a halt overnight. And I've asked people that in my reporting: "What happens if you shut the loophole?" It depends on who is answering the question, but variations from disaster to its done, it's over.

JP: Absolutely. It's just exciting to get a chance to finally have conversations about this really, really important issue that we hope you listening, the public, can carry back to your community and to your state representative, to the federal government and charge a further conversation that we all need to have on radioactivity. In the meantime, stay tuned to us at Public Herald. You can follow this podcast, subscribe to newsCOUP, that's a great place to get the updates on our big reports coming out. You can follow us on Twitter. Justin Nobel is on Twitter, what's your Twitter follow?

JN: @JustinNobel.

JP: You can find me at @JBPribanic. And the reports are going to be coming soon so keep close attention to what we're doing at Public Herald and we'll catch you next time on newsCOUP. Thanks for coming on Justin, it's always good to talk more about this stuff.

JN: Thank you Joshua. So exciting, thank you.

JP: Awesome.

Podcast References

1) **"OCCUPATIONAL EXPOSURES TO RADIOACTIVE SCALE AND SLUDGE_Coleman et al v. H.C. Price Co"** – This is a report from a Louisiana legal case settled in 2016 and written by a nuclear physicist and radioactive-waste specialist who served as an expert witness in the case. The expert uses an analysis program developed by the Centers for Disease Control to indisputably link oil and gas worker cancers to radioactivity exposure received on the job. What is concerning is this report shows that common industry jobs, including derrickman, roughneck, pipe cleaner and truck driver hauling sludge, when done for long enough all involve considerable exposures and can lead to cancers. This document also gives an excellent primer on the oil and gas radioactivity topic, its history and why the radioactivity is there in the first

place. Because the report is written by a scientist it is well-sourced, meaning anyone wanting to follow the trail further has the appropriate references at their fingertips.

2) **"1982 API Analysis of RADIONUCLIDES in oil and gas industry"** - A 1982 document from the American Petroleum Institute in which the industry conducts a self-analysis on just how much radioactivity is produced in oil and gas production, just where it accumulates, the risks to workers and the public, and the liability risks to the industry itself. Liability of course is a key issue, and this document analyzes that specific topic, among other things. This is an incredibly powerful document because it shows the industry has known for nearly 40 years that risks exist, and all the while workers have performed these jobs and continued to receive inappropriate protections and thus exposures. A quick quote from this document to convey the tone and weight: "Almost all materials of interest and use to the petroleum industry contain measurable quantities of radionuclides...API should be more concerned." API of course being the American Petroleum Institute, the oil and gas industry's chief lobby in the United States.

c) **"Peter Gray_NORM Contamination in the Petroleum Industry, 1993_Society of Petroleum Engineers"** - A 1993 article written by an oil and gas industry analyst and published by the Society of Petroleum Engineers which conveys that radioactivity is not just a problem at the wellhead. Because certain radioactive elements flow with gas, oil, and natural gas liquids from the wellhead, this means that pumps, filters and valves in pipelines, compressor stations, natural gas processing plants, refineries and even petrochemical plants like ethane cracker plants can become laced with dangerous amounts of radioactivity too, putting workers in certain circumstances at risk.

Complete copies of the above three papers are available by calling DCS 845-252-6677 or emailing dcs@DamascusCitizens.org