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NEW BRUNSWICK

AN INTERVIEW WITH JUDITH S. WEIS

FOR THE

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INTERVIEW CONDUCTED BY

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Kathryn Tracy Rizzi: This begins an oral history interview with Dr. Judith Weis, on April 1, 2022. I am Kate Rizzi, and I am in Branchburg, New Jersey. Dr. Weis, thank you so much for joining me for this second interview.

Judith Weis: Thank you.

KR: You came to Rutgers-Newark in 1967, and that is also the time that you had a young family. I want to start off asking you, what was it like for you as a working parent?

JW: Well, it was due to great luck that we got an apartment in the Colonnade Apartments, which [are] beautiful [Ludwig] Mies van der Rohe buildings in Newark. They were relatively new and marvelous places to live, and it's a mile away from the Newark campus. So, I could walk to work or bike. I sometimes biked to work.

I had been given minimal lab space when I came. It was basically an office rather than a lab. My initial teaching was in the embryology course, because that's the field my dissertation was in, and I also helped out in some labs for comparative anatomy and something else. The research I started was, basically, follow-ups from my thesis work for the first few years and managed to do it in this very tiny space that I had been given. Eventually, they found another small room that I used as an aquarium room, where I could keep tanks, aquariums, and have aeration, and keep fish or other aquatic animals. That helped a lot.

I was taken under her wing by an older woman in the department, Helen Strausser, who was sort of a mentor. She was an immunologist, so our fields were not at all related, but she showed me the ropes about the university and was very helpful. She was also one of the leaders of the women's faculty group that--I talked about this last week--filed the charges against the University. [Editor's Note: In 1971, Rutgers-Newark professors Dorothy Dinnerstein and Helen Strausser filed a complaint with the Department of Health, Education, and Welfare (HEW) against Rutgers University's Newark College of Arts and Sciences for sex discrimination in employment, based on Executive Orders 11246 and 11357 and the Office of Federal Contract Compliance Guidelines (Title 41, Code of Federal Regulations, 69-20.5).]

We also were lucky in that we found, in the same building we lived, a woman to be a babysitter, a nanna, because we had a baby. Within the space of a few months--it's amazing--I finished my dissertation and graduated. We got two new jobs and moved. My husband got a job at UMDNJ, which was, at that time, in Jersey City, but their campus was being built in Newark. Then, I got the job at Rutgers-Newark. So, it was amazing luck that we had two jobs that were eventually going to be quite close together, but even Newark and Jersey City are pretty close together. We had the baby in June, the first child, Jennifer, so we had the baby, two new jobs, moving, and finding a babysitter within a few months. That was the summer of 1967. You look back and say, "How did we manage to do that?" and we did because that's what we had to do. It all worked out very well. Is that enough? Did you want more? I mean, I could do the stream of consciousness for a long time. [Editor's Note: The University of Medicine and Dentistry of New

Jersey (UMDNJ) merged with Rutgers University in 2013 to form the new Rutgers Biomedical and Health Sciences (RBHS).]

KR: Then, at the same time, you were moving to a Newark that was just in the aftermath of the rebellion. [Editor's Note: The Newark Rebellion took place from July 12 to July 17, 1967 and resulted in over two dozen deaths, more than seven hundred injuries, fifteen hundred arrests and property damage exceeding ten million dollars.]

JW: Yes, yes. Newark was not in great shape at that time. The campus was also probably built as cheaply as the University could possibly have done, and it was mostly concrete, very little greenery, cinder-block-type buildings. It was not an attractive campus, by a long shot. It's not turned into a beautiful campus in the meantime, but it's gotten a whole lot better. There's a lot more vegetation and green space, and a lot less concrete to walk on, and some really nice buildings. It was what it was.

KR: As your children were growing up and you were advancing in your career and you were doing research and some of your research involved field work, how was it with that work-life balance?

JW: My husband and I did a lot of work together over the years, and we found ourselves, by accident, at a marine lab in Montauk. We had gone out for a couple-week vacation and found this marine lab and went in there as a lark to see what they were about, and they seemed to have a lot of extra space. They had more space than people, and we introduced ourselves to the lab head and said, "Would it be possible for us to come and work in the summers here and be close to the marine environment?" He said, "Sure."

For quite a few summers, we went there. We initially rented a house in Montauk, but after that first summer, since we liked being there and the kids had a day camp and we were by the beach, we ended up buying a house in a neighborhood called Springs, which is north of East Hampton. It's a sort of artists' area where Jackson Pollock and those people lived and there are still a lot of artists there, and it's not a Hampton-y sort of neighborhood. You think of Hamptons, and you think of millionaire mansions and stuff. That's not what our area is like at all. We used to have summers with the kids there. When the kids were older, they'd go away for a month to a sleepaway camp, but this was our home in the summers.

In '74, we moved from Newark to Maplewood, and we lived in Maplewood for the rest of their growing up. Maplewood is a relatively short drive to Newark or a train ride, and it all worked out so well. I don't know if I'm answering your question or not.

KR: You are, thank you. At the Rutgers Oral History Archives, we have been interviewing a lot of alumni of Rutgers-New Brunswick, Newark and Camden who graduated in the late '60s, during the student movement period and student protests.

JW: Yes.

KR: What recollections do you have of that period at Rutgers-Newark in the late '60s and of the student protests that were going on?

JW: We had student protests when the Black students took over a building. This was happening in schools all over the country, so it wasn't an exceptional thing. Some of the faculty were very worked up about it, and I really wasn't very involved in any of that. I had friends involved at Cornell, where there was a takeover of the student union, and people I knew at Columbia. These sorts of things were happening all over. As a result, there's a lot more Black studies programs, and without taking over buildings, women's studies programs started. Women didn't take over buildings but made a lot of noise, and I was among the women that made a lot of noise. So, there was positive change that came from all of that. [Editor's Note: On February 24, 1969, members of Rutgers-Newark's Black Organization of Students, or BOS, occupied Conklin Hall to protest the lack of minority students and faculty on campus. On April 18, 1969, members of the Afro-American Society, or AAS, began a thirty-six-hour occupation of Willard Straight Hall at Cornell to protest the university's perceived racism, its judicial system, and its slow progress in establishing a Black studies program.]

KR: I would like to shift to talking about some specifics with your research. Last time, you talked about your early research that you did on the killifish that enabled you to shift back into marine ecology.

JW: Right.

KR: I was wondering if you could talk about how your research developed from that time forward and what you focused on specifically.

JW: Okay. The first move away from developmental biology into a more environmental sort of thing was using the fish embryos to look at effects of different pollutants on the development. We looked at some pesticides, as well as mercury and other metal effects on fish development.

One of the summers in Montauk, there was an NYU [New York University] grad student who was studying fiddler crabs, and I found them really interesting. He showed me his setup and where to collect them. I got very interested in fiddler crabs also and have done a lot of work on them. Studying their limb regeneration is interesting. You can pinch the leg in a right place, and the animal will drop the leg or a claw. This is a reflex that crabs have. It breaks off at a particular place, so it's not greatly injured and doesn't bleed or anything. There's a partition in there; the muscles pull the right way, it comes off, and then, from there, they regenerate. After the regeneration happens, they will molt. The limb grows out folded twice under a layer of their soft cuticle on the outside. Then, when the limb is fully grown, the animal will molt, shed the outer shell, and the limb will unfold and become functional. I got really interested in that process and looked at effects of environmental factors including pollutants on the regeneration and molting in the fiddler crab.

Getting back to the killifish, we started out just seeing out the effects of the contaminants, but we noticed with mercury--the standard procedure was they breed every two weeks, and you can squeeze the eggs out of the female--called strip spawning--and squeeze the sperm out of the male and just fertilize them in petri dishes or whatever. Then, we would take sperm and eggs from a variety of females and males, put them in the petri dish, and then divide them up into different dishes to be exposed to different concentrations of, let's say, mercury. After a couple of weeks, they're ready to hatch. We'd look at them and analyze what the embryos looked like. We would see, within a given dish of a certain concentration of methylmercury, there were some embryos that were totally messed up, there were some that were pretty much fine, and everything in between. There were certain kinds of problems. There were head/eye problems, heart problems and skeletal problems, but they could be very mild or moderate or really severe. We had this hugely diverging bunch of embryos that had all been exposed to the same concentration, which was really confusing. Why is this embryo practically okay, totally normal, and this other embryo hasn't developed at all and is just a ball of cells? This other one, the eyes are cyclopic, and the heart is a tube, and the skeletal is bent. That was confusing, and how do you explain that? We thought, "Maybe we shouldn't bother studying this," and then we said, "Well, let's try to figure out why such differences are happening."

The next time, we kept the eggs from each female in separate dishes. That was the breakthrough; it was the female. Some females gave us eggs that were very resistant, some females gave us eggs that were very susceptible, and others somewhere in the middle. When we used the same female during the next reproductive cycle, they were consistent. Some females were going to give tolerant embryos, and some were going to give susceptible embryos.

That was in Eastern Long Island fish, which is a pretty clean area. These fish are not being exposed to contaminants normally in their environment. Then, we went to the Newark Bay area. This was the early '70s; the Clean Water Act had just been passed. There was a huge, long history of contamination and industrial sites all around Newark Bay, the Arthur Kill, the Hackensack Meadowlands, that whole part of New Jersey. The water was extremely contaminated. The Passaic River had been called the most polluted river in the country. We picked a little creek to study, Piles Creek, which goes into the Arthur Kill in the town of Linden, New Jersey. Why we picked that site is because there was a bridge that went over the creek, so we didn't have to go wading in the muck and we knew the muck was loaded with every kind of thing you can imagine. Also, you can sink in estuary mud. They call it black mayonnaise, and you can sink into it. This bridge was a way to get our fish in traps without having to get into the muck.

We did the same experiments then with the fish from Piles Creek. We'd give each female's embryos a particular concentration, and we focused on the concentration that caused all of those diverse responses in the Long Island fish. Piles Creek fish gave us all tolerant embryos. So, it was all skewed to one end. That same concentration of methylmercury, instead of the diverse responses, most of those embryos came out fine, and there were very few that had skeletal or heart or head/eye problems. This means that these fish in Piles Creek have evolved to become tolerant to the contaminants. We always think of evolution as something that takes thousands of

years, but, here, it could happen very quickly, it could happen in one generation, because in a clean place, you already have some females who give tolerant eggs. Now, it gets polluted, then the ones that are susceptible aren't going to survive. Those embryos are not going to hatch and survive and contribute to the next generation. But, there are females giving tolerant eggs already there in the population. These are the ones that are going to survive and make the next generation of the fish. This is evolution that can happen quite rapidly, because even in the clean place, you already have tolerance in the population.

Additional work on Piles Creek fish: We saw the tolerance in the embryos. Would they be tolerant at all the other stages in life? So, we looked at the eggs and sperm individually and exposed them to the methylmercury and see how successful they are in fertilization after a short exposure to the mercury, and doing that from the clean population and the Piles Creek population. Again, the eggs and the sperm at Piles Creek were tolerant. They could still fertilize at the same amount of exposure that would knock out the eggs or sperm from the clean population.

We've got the gametes, the eggs and sperm, and the embryos that are tolerant. What about the larvae, juveniles and adults? The larvae, juveniles and adults were not, and they were not in good shape. Looking at the life's history, they did not grow as well, and they didn't live as long as the clean population. What we had originally thought would be "super fish" in Piles Creek was not the case. They were not doing well at all. The question is then, why?

It was an accidental observation by a graduate student that set off the sort of switch in direction of this research into focusing on their behavior. The student noticed that the Piles Creek fish didn't seem to go after food as well. Grass shrimp are a small shrimp that are one of the major things that the killifish eat. This grad student was studying the grass shrimp, and he just was using clean killifish. By this time, we were using Tuckerton, where there's a Rutgers marine lab, as the source of the clean fish and crabs and other things. He said that he didn't think that the Piles Creek fish were going after the shrimp as food very well, which set off another set of experiments, additional grad student projects, and it turned out that that was, in fact, the case, that they were poor at capturing food. So, maybe they were tolerant when they were embryos and they hatched successfully, but as time goes on, they're not catching live food as well. We looked at what are they eating. You can preserve some fish and open them up and look in their stomachs and see what they had been eating. These Piles Creek fish had mostly detritus. That's gunk. That's decaying plant material mixed in with some mud and sediments. That's not good food. That's not nutritious. In the lab, we got clear data that they don't capture the live shrimp as well. They capture about one-third as many over a given time period. So, they are eating a diet that's not very nutritious. That can partly account for not growing as well and perhaps for not living as long. [Editor's Note: Rutgers University's Marine Field Station is located in Tuckerton, New Jersey, near the Mullica River-Great Bay estuary.]

We also looked at their behavior as prey, because they're just a few inches long and get eaten by larger animals. They're not a giant fish, and they get eaten by a lot of things. They get eaten by bigger fish. They get eaten by blue crabs. We set up an experiment where the adult killifish

were there as the prey, and blue crabs were predators. It turned out that the Piles Creek fish were much more easily caught by the predator, which can also be responsible for not living as long and also can keep the population down. So, I think the behavior problems definitely can explain the fact that they don't grow as well and don't live as long.

We had some work on potential causes of the behavior and found that their neurotransmitters were abnormal. These are the chemicals that transmit the impulse from one nerve cell to another. In the brain, the neurotransmitter serotonin, in particular, was low. We also saw their thyroid glands were very, very abnormal. A thyroid is very, very much involved in behavior and growth and metabolism, and the thyroid glands were very abnormal. Two potential mechanisms could be involved with the behavior change. These changes of predator/prey behavior also can have effects on the population and also affect other organisms in the community. For example, the shrimp at Piles Creek aren't eaten as much. Their major predator is the killifish, and the killifish is a lousy predator. So, many more shrimp there can live a long happy life. If you sample the shrimp at Piles Creek and compare them to the ones at Tuckerton, the ones at Piles Creek are bigger, and the population density is greater. It's not because Piles Creek stimulates their growth. It's because they're not eaten so much by the killifish. Other threads of that, we really got very interested in looking at the behavior and looked at other organisms, looked at the shrimp themselves.

Since Piles Creek is just one narrow little creek, there aren't many bigger things. We wanted to look at larger animals that are not found in a narrow little creek like Piles Creek and went to the Hackensack Meadowlands for our polluted site to study blue crabs, the predator we used in the experiments. Blue crabs and juvenile bluefish, the snappers, lived in the estuaries. We continued looking at the possible behavioral changes that we'd see in these species in contaminated environments. With the blue crabs, there were similar problems. The blue crabs in the Meadowlands don't capture active prey as well as blue crabs from Tuckerton. If you give them a mussel, something that doesn't move, they eat just as much, but if you give them killifish (active prey), they don't catch them as well. You look at their stomach contents--this is supposed to be a very carnivorous nasty crab--they're eating mostly detritus, the same as the killifish are. That was a bigger surprise, because even killifish from a clean environment eat some detritus, but blue crabs are known to be carnivores and that they have stomachs full of mud and detritus was amazing. But they may seem to get some nutrition from it because they're not smaller and they grow quite sizable. A possible explanation for that might be that there are signs all over in the Meadowlands with a picture of a blue crab, saying, "Do not catch. Do not eat. This is very contaminated." Like the shrimp at Piles Creek grow big because their predator isn't catching them, it may very well be that the blue crabs in the Meadowlands are growing well and doing well because their predator, people, aren't eating them because of all the signs saying, "Don't catch them. Don't eat them." We can't prove that, but it seems to be a logical explanation.

With all of these things, with the killifish and the crabs and the bluefish, which I haven't talked about yet, with the blue crabs and the killifish, we did "switch" experiments, where we put Piles Creek or Hackensack animals in clean water for a couple of months to see if they improved in their behavior, and they did. Then, we also put the clean animals in aquariums with the mud and

water from the polluted site and food from the polluted site and saw that their behavior changed to be the poor-capture ability. So, it's clear the environment is causing the behavior problems.

Bluefish are interesting in that they are mostly ocean-dwelling fish. They breed in the spring, and the young ones go into an estuary for the summer and then, in the fall, go back out to the ocean. The question we had here with the bluefish was about the bluefish that spend their summer, their youth, in a polluted estuary, how do they compare with bluefish that spend their youth in a clean place? We caught the young ones in the spring coming in at Tuckerton and kept them in large tanks at the NOAA [National Oceanic and Atmospheric Administration] Sandy Hook lab. We had collaborators at Sandy Hook, where they have very large circular tanks in rooms at their lab. (I don't have room for such things at Rutgers.) The student did a lot of the work there. All the small fish were caught at Tuckerton at the beginning of the spring and raised in these tanks, being fed frozen fish, killifish and menhaden, taken either from Tuckerton or from the Meadowlands. So, they're getting a clean diet or a polluted diet of the kinds of fish that bluefish eat. (Young bluefish eat mostly killifish and menhaden.) These baby bluefish were then monitored over the summer for their growth, for how much did they eat, and for how fast did they eat it? Every day, they would get a certain ration, and we would time how quickly it took the group of them to eat all the ration. Then, you give them another ration if they finish fast and time that and so forth.

Over time, the ones getting fed the contaminated diet, the killifish and menhaden from the Meadowlands, began to start eating less and catching them more slowly. Their general activity was measured in a large tank, where they would swim back and forth, and we would time how fast they were swimming. Their swimming speed went down. By the end of the summer, they were considerably smaller than the ones being fed the clean diet. At the end of the summer, in the fall, the ones out in the wild are going to have to go back out to the ocean. One can imagine that the ones coming out from the Meadowlands, in the fall, are slower and smaller and weigh a whole lot less than the ones coming out from clean estuaries like Tuckerton, Great Bay. So, I think the prognosis for those fish, once they get out in the ocean, is not very good, because in the ocean, there are big predators, and they're slow and small. I don't think there's much future for these fish that are going back out to the ocean.

Up until now, we're looking at Tuckerton fish that are being fed the contaminated diet. We were not looking at the fish living in the Meadowlands. In the early fall, we went to the Meadowlands to check on the fish. Looking at the fish in the Meadowlands, overall, they were smaller than the ones at Tuckerton, as would be expected from the lab experiment. We also looked at what they were eating, and they were eating, in fact, killifish and menhaden, the same as they were fed in the experiments. However, there were a large number of them that had empty stomachs. Now, people over the years have looked at stomachs of snapper bluefish, and there's always a very small percentage with empty stomachs. They've looked in Chesapeake Bay and all over, including Tuckerton. In the Meadowlands, there were a sizable number with empty stomachs, which seems to support the fact that they don't catch their prey very well, and they don't eat detritus. Unlike the blue crabs and the killifish, apparently, a bluefish would rather be hungry than eat detritus.

She also analyzed the mercury and PCB [polychlorinated biphenyls] contents of the fish in their stomachs, as well as the PCB content of the fish swimming around in the water in the Meadowlands. It turns out that the fish that got eaten, the killifish and menhaden in the stomachs, had higher levels of the contaminants in their tissues than the fish that didn't get eaten, which I think supports the earlier findings that a more contaminated fish is slower and easier to catch. That was a very interesting finding.

There was a lot of fiddler crab work. Fiddler crabs aren't predators, they process sediments. They clean little algae and stuff off the sediments, so they don't have to catch food--an easier life than a predator. We did life-cycle studies of the fiddler crabs from Piles Creek compared to Tuckerton. Juvenile or adult crabs at Piles Creek do fine because the sediments there have more nutrients and single-celled algae to eat because there were sewage treatment plants providing more nutrients. They don't have to spend as much time eating. Fiddler crabs dig burrows, but they spend time up on the surface eating and wandering around; the males wave their claw to attract females for mating. But in general, they spend a lot of their time down in the burrow, where they're protected from predation. When they're out in the open when the tide is low, they're vulnerable to predators. The birds can swoop down and catch them; larger crabs can eat littler ones, et cetera. Being down in a burrow is being safe. Piles Creek crabs spend more time down in their burrows than Tuckerton crabs, because they get more nutrition from feeding on the sediments because the sediment is enriched. Once there are juveniles there, they do quite well.

The crunch comes when they reproduce and the larvae are released out into the water, and the larval stages float around in the water and go usually downstream into saltier water, into the Arthur Kill and so forth. There are a few weeks when the larvae are out there and then they come back to settle. That's when there are problems at Piles Creek--during the larval stages, when larger numbers die and far fewer come back to settle. There are a smaller number of crabs, but those that make it can do well because there's not so much competition, and they are in good nutritious sediment. It's contaminated, yes, but they can spend more time underground, where they won't get preyed on so much. The crunch is coming during that larval stage, and once you've got the tough survivors making it there, they do all right and they can grow large and they have less competition.

Both the clean population (Tuckerton) and the polluted ones, when preparing to molt, move the metal contaminants from their body tissues into the shell and then molt and they get rid of the metals along with that shed shell. That's a really cool way to get rid of contaminants in your body! Just think of that; how cool is that? Put the contaminants out in the shell, and then you can get rid of them. The Piles Creek crabs put a greater percentage of their contaminant levels into the shell. I imagine crabs all over the world in contaminated sites are doing the same, can clean themselves out by molting.

That's sort of sums up life in a contaminated estuary, the killifish, the fiddler crabs, the grass shrimp, the blue crabs, the bluefish. That was a long thread that went through a few decades of

research in our lab, and a large number of grad students did dissertation studies on different aspects of this.

We also had other totally different sorts of research projects, looking at salt marsh plants. *Spartina alterniflora*, cordgrass, is native. This tall reed, *Phragmites australis*, is an invasive species. It's not native. It does tend to take over the marsh, and people for decades have been spraying them with toxic herbicides (when they can get money) to restore a marsh. They spray glyphosate to kill it and either hope that the native species will come back or plant some. Often ten, fifteen years later, *Phragmites* comes back, so it gets done over again. Some marsh managers make a very nice living by killing *Phragmites*.

We wanted to see what other harm *Phragmites* is doing on the marsh. There's a creek in the Meadowlands that has the *Phragmites* on one side and *Spartina* on the other side, a perfect study site to look at the animals on this side and this side and compare them. They've got the same water, the same tidal cycle, everything is the same, except for the plant species. In terms of the crabs, in terms of the little critters in the mud (benthic species), those worms and clams, etcetera, in the mud, it didn't matter which plant was there. In terms of the fish, there's one species of fish where it really does matter, which is the killifish. The killifish really like *Spartina* better than *Phragmites,* but in terms of most others, it didn't matter which species of plant was growing there.

We also investigated how the two types of plants deal with contaminants, specifically with metals. Looking at the two plant species, both take up the metals from the mud into their roots. *Phragmites*, the "evil invader," stores most of it down there in the roots. *Spartina,* the native species, sends more into the stem and leaves. The stems and leaves fall off in the autumn, which makes the metals available to everything living in the water. What remains in the roots stays down there; it's not available to transfer to other organisms like fish or crabs.

Also, *Spartina* has, on the bottom of its leaves, salt glands, which is why this plant can live in such salty water. It excretes salt from these glands, and also excretes metals along with the salts. When the tide comes up, it washes the metals off into the water. So, *Phragmites* is really better for the system, in terms of keeping the pollutants out of the way, whereas the *Spartina* is sending more to cycle back again through the whole estuarine system. Other people have found that *Phragmites* is better at sequestrating nitrogen, which, as a pollutant, causes what we call eutrophication, excess nutrients in the water, excess algal growth, which then dies, causing low oxygen in the water. We have lots of regions of the world with this problem of low oxygen or harmful algal blooms. So, *Phragmites* does better with nitrogen than *Spartina*. *Phragmites* sequesters carbon better, carbon dioxide, so by absorbing more carbon dioxide, it's doing better in terms of climate change.

Also, *Phragmites* enables a marsh to elevate faster. This isn't our work, but it's all related. A marsh has to elevate in order to keep up with sea level rise. *Phragmites* does that better than other plants because when it dies and falls down, it's bulkier, the stems are woodier, so it takes it longer to decompose. While it's lying on the marsh surface, it's trapping more sediment. With

dead plants lying on top of the marsh a longer time, trapping more sediment, that enables the marsh to elevate more. So, there's a lot of good things, very important good things, that *Phragmites* does.

There are a number of us that are trying to get the management to look at this in a more balanced way and not say, "Oh, *Phragmites*, this is bad. We have to get rid of it." Currently, perhaps the good it does outweighs the bad it does. We're working to make some changes in how the species is managed.

Some other things I've worked on, another whole thread, is habitat, looking at, let's say, mangroves. I had a student who worked with the mangroves in the tropics, looking at their role as a habitat for invertebrates that grow right on the roots. The upper parts of the roots that spread out are in the air and water and then down into the mud. Mangroves are intertidal vegetation, like salt marshes, but they're tropical. Their aerial roots often have a whole variety of invertebrates that attach and will be living on the roots. The part of the roots that are under water also provide a habitat for fish, little fish, that are protected. The big fish can't get in there. Mangroves are a habitat and a nursery area for many fish species. In some cases, the young fish live there and later go to a nearby coral reef when they are larger. There are also species that stay small and live among mangrove roots their whole life; so mangroves are important in supporting the coral reef fishes.

We did a study in Florida, where there was an artificially-built canal that had rocks on the side. At high tide, there were a lot of fish that would hang around by this wall. When low tide would come, the fish would have to go downstream because the water level went way down. We did a scuba-diving study, going to certain sites and noting which particular fish were in a particular place. Then, the tide would go out, and then it would come back the next day, and we found the same fish in the same location. It's their habitat, but it's only a temporary one. When the tide ebbs and the water goes away, the fish must have another habitat somewhere downstream.

We also compared habitat value for *Spartina* and *Phragmites*, and saw that the two plants were pretty equivalent in providing habitat and protection for shrimp or crabs or fish. So, that's another whole avenue. I think I've been talking non-stop for a very long time.

KR: This is great. If there are other threads that you would like to explore, please go ahead. What I do want to ask you is, how did your findings impact policy making? What sort of work did you do for government agencies and environmental agencies, and how did your findings impact policy?

JW: One thing that I haven't talked about that probably is the one that I can point to having the most policy impact. It was work we did in the '90s. We think of metal pollution coming mostly from factories and plants and getting dumped in the water, but some of it is coming from structures that are put directly in the water, wood. When there are docks with pilings or bulkheads made of wood, if you use plain wood, it may decay. Usually, wood is treated with chemicals, and up until at least in the '90s, it was common to treat the wood with what's called

CCA, chromated copper arsenate. This involves large amounts of chromium and copper and arsenic pressurized into the wood. Before we started looking at this, the word out there was that, "It doesn't leach out," said the Wood Preservers Association. There had been very little study.

Our first experiment was putting a little piece of wood in a tank with some critters (algae, snails, shrimp) and they, particularly snails, died. It does leach. That led into a whole slew of studies, some work in the lab and some field studies, showing the fact that it leaches and that copper is really the problem. We think of arsenic as the bigger problem for human health, but for most marine animals, copper is the more toxic substance. If you've got excess snails or something or too much algae in a pond, they'll put copper in the water to kill them because snails and algae are very sensitive to copper. Copper is also the one that's most concentrated in CCA.

We did a lot of studies looking at how far it would spread out in the mud going out from a bulkhead and what the concentrations were in the animals living in the mud closer to and further from the bulkhead. We had a sabbatical at an EPA [Environmental Protection Agency] lab in Florida in '92. Down there, there were oysters that would attach on these bulkheads. If you open those oysters up and look at the animal itself inside the shell, it had a green tinge. That's from copper. The Statue of Liberty is green because of copper. These oysters look green from the amount of copper they took up. Then, we set up a study with some of those oysters and a carnivorous snail that was able to open up the oysters and eat them and saw that the snails that were being fed the oysters from the bulkhead didn't grow very well compared to snails that were being fed oysters that we got off rocks. They also had a higher mortality rate and so forth. This shows that these metals pass up the food chain. The snails in the experiments were not directly exposed to the wood. They were just given the oysters to eat.

There were a lot of studies over a decade on this CCA wood, and that, I think, contributed to changing--I don't think CCA wood is put in the water much anymore, and I know of various municipalities that banned the use of it. I think that set of studies probably had the most impact on policy.

It was also interesting how climate scientists get vilified by the oil companies, and people that studied problems with cigarettes got vilified by the tobacco companies. The wood preservers went after us. Fortunately, they are particularly stupid, and they had no grounds to stand on. Also, I was glad that I was a senior scientist by the time I ran into this sort of industry opposition. The wood preservers are not as powerful as the oil companies; they had some hired-gun scientists, but I was already a senior scientist, and it was pretty easy to demolish them.

I remember giving a talk at a conference in Atlantic City, one of a series of conferences that the EPA sponsored called Shallow Water Conferences. At most ecological/environmental conferences, people are quite informal. You don't see many people dressed up. I was getting ready to give my talk, and lined up in the back of the room are a bunch of guys in suits. You know the guys in suits are not shallow-water scientists. Then, they had what they thought were very challenging questions for me, like, "Did you use controls?" Now, an undergraduate biology student knows this. That was amusing.

KR: They were no match for you.

JW: Yes. I'll tell you what I did do; I did not get any graduate students involved in any of these studies. My graduate students were doing other things because I didn't think that would be fair to put a young budding scientist into that kind of nasty arena.

Indirectly, our behavior work has, I think, contributed to a whole new field of work of what's called behavioral ecotoxicology, because behavior is a very sensitive response to contaminants, and it's also a response that has very clear ramifications for the animal's life and for ecology. Behavior is sort of a link between an individual animal and other animals, particular predator-prey behavior, and it links directly to ecology. So many other people in the field of ecotoxicology expose an animal and then look for changes in some enzyme or changes in gene expression or something, which are biochemical and molecular responses, which would take a few more steps to have effect on the animal's ecology. Behavior, I think, is really a very important and sensitive kind of response. Our behavior work was not just exposing an animal in the lab to something and seeing how its behavior changes, but taking animals out of real situations; the real mixture of whatever is there in Piles Creek or in the Meadowlands is what's causing the behavior differences. It's much more real than taking a fish and giving it a certain amount of mercury or PCB or something else. This is not impacting policy but impacting other science. Following our work at the very beginning, with the killifish embryos and mercury tolerance, other people have looked at killifish in other polluted habitats, habitats that have high PCB levels or high creosote PAH, polycyclic aromatic hydrocarbon, levels, and seeing that the fish evolved to become tolerant to these contaminants. Killifish are now well known as a species that can survive in a whole lot of places where practically nothing else can, because they can quickly evolve tolerance.

I'm not sure what policy implications would come from that. For example, somebody may look and say, "Oh, these animals get tolerant. Well, we don't need all these restrictions. We can let it get more polluted because they adapt and they become tolerant, so we can change the water-quality criteria." That would be very unfortunate, because the fact is that certain species can do that, killifish as a major one, but there's a whole lot of species that don't. In point of fact, Piles Creek and Meadowlands have lower diversity of species than healthy clean places. What we're studying are the survivors, so you don't want somebody to say, "We can just relax the water-quality standards." That would be a very bad policy implication for that.

I hope that the work on *Phragmites* will lead to more people thinking about not having this reflex reaction, "Get rid of it. It's bad," and that there will be a more balanced smarter view about that species, because the positive things it's doing, to my mind and to others, outweigh, at a time of sea level rise, the negative effects on diversity. For the very existence of the marshes, they have to elevate faster than sea level rise, and most of them are not.

For New Jersey, there's an alternative for a marsh. If it can't elevate fast enough, it might be able to move inland, if there's empty land behind it, and in New Jersey, Delaware Bay can do that.

The marshes in Delaware Bay have a forest behind them, and as the water rises, the marshes are moving up. As the saltwater is coming in, the forests are dying, and they call them "ghost forests." The trees die because the saltwater is coming up. But the marsh is coming up also. So, Delaware Bay can survive by moving inland. Barnegat Bay, Raritan Bay, Newark Bay, Hackensack are highly developed. Barnegat Bay isn't highly developed, but it's a barrier island. So, they're losing ground, and their only option is elevating because there's nowhere to go inland because of roads and houses in the way. In a developed state like New Jersey, the *Phragmites* might, in fact, be the savior and allow more marshes to continue to exist by the end of this century. I worry about the marshes a lot.

KR: I would like to ask you about your involvement in environmental justice. When did you first become involved in the environmental movement?

JW: During the Reagan administration. I was busy studying pollution, and I read about what's going on in Washington with the EPA and environmental policy. I thought to myself, "These people just don't understand." I had also read *Silent Spring*, which had been an influence in switching the research from developmental biology into environmental science earlier. I got involved with a local group in South Orange-Maplewood that was protesting against potential spraying of a certain insecticide. I think it was for gypsy moths. Gypsy moths, in the early '80s, were a large infestation. That was my first real involvement in an environmental protest. Then, with the Reagan administration, I thought, "I have to do more than just deal with this carbaryl protest for the gypsy moth."

I learned about a program of the American Association for the Advancement of Science, AAAS, where scientists could come for a year to work in the federal government. It was mostly to work in Congress back then. The program has since expanded, where they have ten times as many people coming now than they did back when I went, in '83-'84. I applied and I had an interview and all of this, and I became a AAAS Congressional Science Fellow. I spent a year working in the Senate with the Environment and Public Works Committee, and it was a major learning experience, I must say. I arrived, and they said, "You know about pollution, right?" I said, "Yes, I know about pollution. I study it." They handed me a pile of documents about the Safe Drinking Water Act, which I had never heard of before. I studied estuaries, marine things; I knew nothing about drinking water. But it's water, it's pollution, I read all the stuff and I learned. I learned about ground water, which I had never known before. It was a huge learning experience. I can't say that my being there had much of an impact on anything. I think that the staffers that are there for a long time wield a huge amount of power. Someone coming in as a scientist from outside contributes to some discussions, certainly, but I can't point to some clause in any law that I can say, "Well, I put that in there." I can't do that, but I certainly learned an enormous amount and made some new friends that are still my friends. It was a great year. [Editor's Note: The American Association for the Advancement of Science (AAAS) is a nonprofit organization that advances science, engineering and innovation.]

Our kids were teenagers then, and I commuted back and forth on weekends to New Jersey. That year, there was an airline called People Express, where you could fly--the cheap ones were

nineteen dollars, and the expensive ones were thirty-nine dollars--back and forth between Newark Airport and Washington National. So, I spent a lot of time on People Express, and I had my own apartment to live in. I found myself an apartment and it was on the Metro. This was the first time I ever lived by myself because I went from my parents' house, to college, and after college, we got married. So, I never had a place of my own. This was my first time living in a place by myself five days a week. It was also good because my daughter was sixteen or so, and we weren't getting along very well. My being away improved our relationship a lot!

I loved Washington. I was back in sort of an urban environment, rather than out in the suburbs. I had grown up in New York City, as you know, and I loved Washington and went to theaters and concerts and all that and made a bunch of friends, not just through the AAAS fellows but other people. I met people who worked for EPA and NOAA [National Oceanic and Atmospheric Administration] and people in the various agencies and developed a whole circle of friends down there.

A lot of people who came to do this fellowship are young people who just finished a post-doc or perhaps just finished graduate school and take these fellowships. Somewhat less than half are mid-career to late career scientists. I would guess that most of the young people that come on these AAAS fellowships end up staying in Washington in some capacity, working in the government. I had never any intention or thought of doing that. I enjoyed it, was not going to change my career in the middle. I enjoyed the research and being at Rutgers, so this was just an additional thing.

From then on in, I stayed active in the policy world in various ways. I think one of the things I liked the most was getting on advisory committees to different government agencies, which I've been doing pretty much since then, whenever an opportunity arises, for EPA, for NOAA. I was on the Sea Grant Advisory Board of NOAA for almost a decade. The New Jersey DEP started a Science Advisory Board back in 2010, I guess. What had happened in DEP was that the Office of Research had dwindled down over the years. They used to have a very large Office of Research, and then it was shrunk through the budgets over the years. I think they decided to have a Science Advisory Board in order to be able to do what they needed to do and get some free expertise, free advice, from scientists around the state, and people are happy to do it. So, we have a Science Advisory Board. [Editor's Note: The Science Advisory Board (SAB) of the New Jersey Department of Environmental Protection (DEP) provides independent peer review and advice on scientific and technical issues relevant to the DEP's mission. The Science Advisory Board delivers its findings and recommendations to the commissioner through the DEP's Division of Science and Research. The SAB's four standing committees are: Climate and Atmospheric Sciences; Ecological Processes; Public Health; and Water Quality and Quantity.]

I was the first chair. I was asked if I would chair it, and I said, "Sure." I had had, by that time, quite a lot of experience in other advisory boards. I think I've been chairing the SAB for DEP for a dozen years. I enjoy that, and I'm happy to do this work. It's information I'm interested in, and there's a whole bunch of other scientists from the private sector, from other universities, that are on various subcommittees of the Science Advisory Board. That has been very positive.

What else? A bunch of other things. I'm also active in the Sierra Club, as an environmental organization, over quite a few years. I could always just keep going, but I'd rather give you time for more questions.

KR: What other professional organization have you been involved in? What other environmental activism have you done?

JW: Okay. In terms of professional organizations, being in D.C., that year as a fellow was really a pivotal year in terms of not only getting involved in environmental issues with groups like Sierra Club but also in terms of connecting with professional organizations. I somehow connected in with AIBS, when I was down there, the American Institute of Biological Sciences, which is an umbrella organization where many other smaller scientific societies are members of AIBS. They put out the journal *Bioscience,* which is a very well-known, highly-reputable journal for mostly the organismal and ecological/environmental side of biology.

One thing that I was really concerned about and wanting to do something about, was that the individual societies--getting back to the AAAS Congressional Fellowship Program--the AAAS directly funds a small number of people. Most of the people who come are sponsored by different professional societies. Quite a few different engineering societies send people every year to the AAAS program. The American Chemical Society sends a couple of people. The American Physical Society sends some people. The American Geological Union sends people. In terms of biology, biology is the largest field, and yet biological organizations were not stepping up to send people to participate in this program. I became an advocate for getting biological organizations to sponsor fellows for the AAAS program. I convinced American Institute of Biological Sciences to do that and the Ecological Society of America. They both did that for a while, and I guess maybe they just don't have the finances that some of these other organizations have. The American Psychological Association sends about five people every year. I don't understand why the biology societies couldn't do more, but I got them to sponsor fellows and they did that for some years.

Then, they decided, when it came to policy, they would get more "bang for the buck" if, instead of sponsoring a fellow, they hired somebody to work in the office. There's a public policy person for Ecological Society of America and AIBS, and probably they do get more bang for the buck, because when you're sponsoring a fellow, you can't tell the fellow what to work on. The fellow is going to work in some office, at a committee or a particular member of Congress, a particular senator's office, and work on the agenda that that office wants, and not the agenda of the society that's funding them. From the point of view of the society, they get more bang for your buck if you hire your own policy person who works in the office, rather than somebody who's working in a Senate office or in a congressional office or something, on the agenda that that office has. It makes sense and it's sad, but I understand. We still have very few biological organizations that send people to participate in the AAAS fellows program.

Having gotten involved with the societies that way, I ended up on policy committees for AIBS and for the Ecological Society and for what was then called the American Society of Zoologists. It changed its name to the Society for Integrative and Comparative Biology, which is a much trendier-sounding name. I ended up serving on several committees for AIBS. Then, they asked me to run for president, and I was elected president. I was president in 2001, and I served on policy committees for the Ecological Society and some committees for the Estuarine Research Federation. I would say the '80s and '90s was the high period for being involved. I was also on the board of the Society of Environmental Toxicology and Chemistry, and then I was on the board of the Association for Women in Science, AWIS. That was in the '90s and early '00s.

KR: I am curious about something, when you were chair of the Science Advisory Board for the New Jersey Department of Environmental Protection, what was that advisory committee focusing on?

JW: We focus on what the DEP asks us to do. Most of the projects we do originate from some office in DEP that needs to know something, and they have to formulate certain questions and clarify in their own heads what they want us to do, to look into. Then, if it is approved by the Commissioner, it comes to the SAB, and generally, most topics get assigned to one of the subcommittees. There are subcommittees on human health, water, air and atmospheric science [and climate], and ecosystems. Most of the questions originate with some office in DEP. There are some projects that originate with the SAB itself, where we say, "We really ought to have a study on 'X'." Then, we propose it, and DEP (the Commissioner) has to approve that, for us to do that; we just can't do it on our own.

I'm pleased that I proposed one of the ones that was completed a couple years ago--that originated with me--was to look at the status and future of our tidal wetlands, our salt marshes, and look at potential remedies. We had a wonderful working committee, and so that didn't go to one of the subcommittees. It went to an ad hoc committee; we picked people who are on some of the subcommittees. I chaired this group with five of us--four? We put together a report, which was very well received. Then, someone suggested we could turn this report into a paper for a journal, which we did, and this paper that came out last fall. The report to DEP was in 2019. The paper finally got published back in October 2021, and it got a great deal of press. Rutgers' press office did a wonderful job, and we had attention. We were on PBS. We had something on the radio. Newspapers around the country picked it up, and that was very satisfying. I think that's the first SAB report that turned into a journal article. I don't think any others had done so, but I think it's a good precedent. It certainly wouldn't be applicable for many topics, but this was a very newsworthy kind of thing, "We're going to lose our marshes unless we do something about it." I don't know if you read any of those. [Editor's Note: The New Jersey Department of Environmental Protection Science Advisory Board Report is entitled "The Status and Future of Tidal Marshes in New Jersey Faced with Sea Level Rise," released in October 2020. The report received press coverage in October 2021 in local, Rutgers and national press outlets. For example, Earth.com featured "New Jersey's tidal marshes are vanishing," by Crissy Sexton, which can be found at https://www.earth.com/news/new-jerseys-tidal-marshes-are-vanishing/ Within Rutgers, there were numerous articles about the study, including "Rutgers-

Led Study Finds New Jersey's Tidal Marshes in Danger of Disappearing," which can be found at https://support.rutgers.edu/news-stories/rutgers-led-study-finds-new-jerseys-tidal-marshes-in-danger-of-disappearing/]

KR: Actually, I know exactly what you are talking about, yes.

JW: Do you?

KR: This is a really important issue because it has to do with climate change, and it has to do with rising sea levels. Your report got this press. Do you think it is going to impact how New Jersey moves forward in the future?

JW: I certainly hope so. I mean, that's the point of the SAB reports. We are constrained from making direct policy recommendations. They don't want us to say, "You should do 'X'," but we discussed four different options that don't have to be independent but could all happen and talked about the pluses and minuses of all four of them. I certainly hope that this is going to be followed by actions, but we can't say, "You should do 'X'." That's one of the constraints.

KR: What were the four recommendations, if you could just give me an overview?

JW: Yes, the four things were, one, change the way we manage *Phragmites*, that was one. One was--they call it "migration pathways." This when there is development right behind the marsh and there's nowhere for it to move up. Undoubtedly, the houses in the way are getting flooded very often and probably have wet basements and probably are now finding wetland plants in their backyard. It's undoubtedly an area where some people are thinking about moving and getting out. The state can facilitate that, enable the people to get out, tear down the houses, and make room for the marsh. That process gets into an area that we as coastal marine scientists are not experts in. It's the matter of social workers and planners, working with communities, to make this sort of thing happen. Planners and social workers are in great need to make that sort of thing happen.

Then, getting into more engineering sort of things, one option, when a marsh is eroding at the edge, you can put some hard thing right in front, like a set of rocks, or an oyster reef, or something like that. When it's eroding from the edge, it's due to waves, and if you can put something in front--they call this a "living shoreline"--you've got a marsh being protected by the hard stuff, and these are being built. There are projects in Delaware Bay. There's one by the Earle Naval Station along Raritan Bay. The organization called NY/NJ Baykeeper is putting in a living shoreline, an oyster reef, there. The oyster reef will provide additional benefits since oysters filter and clean a lot of water. These projects are experimental, and there's no recipe that will work exactly from one place to another. One site is different from another in terms of how to do it and where to put it and how it will work.

The same is true for the fourth option, which is spraying sediment from the tidal creeks or the bottom onto the top of the marshes. If the marsh is not elevating fast enough, give it more

sediment on top. Now, that, of course, is going to kill the grasses that are currently growing there, and all the good things that the marshes do are going to be out of commission for a while. But you can either plant new plants on the top of the new layer or wait, and the other ones will come through in another couple years. So, there will be at least one year that the marsh is not functioning like a marsh. It's not pretty like a marsh; it's all mud, but you've given it a few more inches. One question is, how many more inches? How high do you want to make it? You need to use the right type of sediment. If you spray the wrong kind of sediment, if it's too pebbly and rocky and sandy, it won't work. It needs to be the same consistency that the place was. They call this "thin-layer placement." There are experimental trials of this also going on in Delaware Bay. Again, every place is different from every other place, and there's no one size fits all. But like the living shorelines, these seem to hold a lot of promise.

Both the living shoreline and the thin-layer deposition are quite promising and fairly costly. The change in *Phragmites* management is the least costly. We're spending money killing it. If we decide to leave it there in some places, that's saving money; that's not spending money. Again, that has to be tried, how to do it, where to do it. We're not saying, "Just leave it all there, wherever it is." That is not the point. The point is managing it smartly. For the marsh migration pathways, the cost is in the buyouts of the houses mostly, or if you're removing a road, there's costs involved there. It may be that the houses, in another ten or twenty years, would be abandoned anyway as the sea continues to go up. So, those are the four possible remedies.

KR: Are there any other interesting topics that you explored on the Science Advisory Board that stick out in your mind?

JW: Well, the one I'm involved in currently is a topic that's been occupying my attention before this, which is about the issue of microplastics, which had not previously been a focus of attention. Probably if I were thirty years younger and still had a lab and students, that might be something we would be studying. But I've been following the research and seeing a lot of research I think is not very relevant to the real world, and people are often sampling for them in ways that miss a lot of them. For example, sampling in the water, they pull plankton nets through the water near the surface and then look at what they collected. The problem with nets is that long thin things tend to go through the pores of the net and are greatly underrepresented in the samples collected. When people look at whole water samples, rather than having gone through a net, they find the most abundant type of microplastics in the water are long thin fibers that have come off our clothes. You wear synthetic clothes; you wash them, it sheds thousands of microfibers each wash. You dry them, sending microfibers into the air. You wear them, you walk around, you shed them as you go about your day. We have a lot studies that are sampling them with nets and just not finding the accurate percentages, and if you do it without nets, the microfibers are the most. For finding solutions, you should focus on these microfibers, focus on textiles as a major source from the manufacturer, which is releasing tons of them into the air, to the wearing of them, to the washing and the drying and the disposal, the whole lifecycle of textiles. That would be the most important approach, in my mind, to making a big dent in the problem of microfibers in the environment.

The other major source is tire wear, when your tires get thinner. What happened to all that rubber? It's not just plain rubber; it's mixed with plastic. Where'd it go? Did it vanish? No! Matter is not created nor destroyed. It shed tiny pieces on the road as you drive along, and they get washed down the storm sewer when it rains. So, tire wear particles are very important, too. In this whole area, there isn't a remediation plan. I don't think it's in the interest of the tire makers to come up with a tire that doesn't wear out because then they would lose business; they won't be selling any more tires. So, I have no insight into that source of microplastics, but I think the whole issue of textiles is where major solutions can come.

I can put in a plug. I have a book that will be coming out on this topic next month. It's a co-edited book with chapters from experts all over the world, and it consists of chapters from environmental scientists looking at the problem of microplastics and other chapters from textile people. So, we're bringing together the two fields of the problems and solutions. The book is called *Textile Pollution: The Problem of Microfibers*. It should be coming out in May. We're hoping it can be read by environmentalists who are interested in the problem and also used in college courses, sustainability-type courses or environmental studies-type courses, and also there are lots of schools that have textiles departments. A lot of the ag schools have a textiles department. So, we hope to bring cross fertilization between environmental and textile folks and get some action on that. So, that's the current DEP report that I'm currently working on.

KR: What have been some other highlights of your environmental activism, maybe actions you have participated in or conferences you have gone to?

JW: Well, I'm part of the "Marine Team," which used to be called the "Marine Action Team," of the Sierra Club, people from all over the country with an interest in the marine environment. We have a larger overall group of people who get informed about things, and then a smaller "core" group who really do the work. The core group has been to a number of conferences in Washington that include trips to the Hill to talk to legislators, talk to the staff really, occasionally talk to a legislator. I ran into Cory Booker in the hallway one time. Those have been enjoyable conferences. They have plenary-type speakers and then smaller group discussions on things, and it's been the science and the policy together. There's another one coming up. It's, I think, virtual. When it's virtual, it's not the same. There's this thing called Capitol Hill Ocean Week, which brings together--best in person but next best, I guess, on Zoom--activists from different organizations involved in ocean things. [Editor's Note: Cory Booker has served in the U.S. Senate representing New Jersey since 2013. He was the mayor of Newark from 2006 to 2013.]

KR: How much have you noticed that different presidential administrations impact the access that these environmental groups or professional organizations have on actual policy making?

JW: Oh, we had four years of Trump, and we could do nothing except scream and holler and cry. Eight years of Bush was almost as bad, not quite as bad, and it was, of course, Reagan's administration that got me into the whole thing because of being upset and angry about what they were doing. It makes all the difference in the world, which is a reason I worry about the next presidential election.

KR: How about in New Jersey with changes in gubernatorial administrations?

JW: It applied to the Christie administration, too. There were considerable problems with the Christie administration, although I must say, I guess because we had no power, SAB could continue to function normally and it didn't matter really, but SAB isn't powerful. We can't recommend, "You should do this." But it did set back things in New Jersey. He pulled us out of the [Regional] Greenhouse Gas [Initiative], the [RGGI], with multiple states, RGGI [pronounced "Reggie"], Regional Greenhouse Gas Initiative. It was the Mid-Atlantic, New England states together, and New Jersey had pulled out during the Christie administration. So, yes, it does make a difference. It makes a very large difference. [Editor's Note: Chris Christie served as the governor of New Jersey from 2010 to 2018. The Regional Greenhouse Gas Initiative, also known as RGGI or "Reggie," was formed in 2009 between states of the Mid-Atlantic and New England to reduce carbon emissions. In 2012, Christie withdrew from the agreement. In 2018, New Jersey rejoined the agreement under Governor Phil Murphy.]

KR: What sort of work have you done trying to facilitate women getting into the sciences or promoting STEM fields geared towards women?

JW: Rutgers had an NSF [National Science Foundation] grant called an ADVANCE Grant. The principal investigator was Joan Bennett, New Brunswick. She's a mycologist. She's a member of the National Academy of Sciences. She was the principal investigator, but they set up campus coordinators for Camden and New Brunswick and Newark. I was one of the two campus coordinators for Newark--there was me and then a social scientist. We had that for a total of six years. We had funding, mostly for educational activities, and also focused on assisting untenured women, assistant professors, to give them funds to help them get papers published, go to conferences, to get their career going. That was very fulfilling. A lot of the women I remember supporting are now associate professors and being chairs of the graduate program in their department or whatever, and that was a very rewarding thing to be able to do.

We also spent some money to have a session, a campus meeting, for all interested people, honoring the two women, Helen Strausser and Dorothy Dinnerstein, who, back in 1970-ish, filed the sex discrimination charges to the federal government that eventually we won--I told you about this the last time--and to honor them. They're both deceased, but there was a daughter from each of them that we could contact who came to it. We also had a history graduate student named Kate Mahaney, who wrote a report that's up on the web, finding out behind the scenes what was happening in the government and what was happening in the central administration in New Brunswick dealing with the charges that we filed and that we eventually won, because people forget. Most of the principals are no longer there anymore, and all of the students are long gone and most of the faculty are retired or gone or dead or whatever. So, that was a wonderful thing, especially that they each had a daughter who came.

KR: Well, I just have a couple more questions. We have been going for about two hours today. Over the course of your career at Rutgers, you have done much service to the Rutgers community. What have been some of the highlights?

JW: In terms in service?

KR: In terms of service, such as chairing committees and you have been involved with the union. What have been highlights that stick out in your mind?

JW: Well, I think being involved--I don't know if it counts as service--I mean, being involved with Helen Strausser and Dorothy Dinnerstein and getting that complaint together, I worked on that. My name is not on it because I was an assistant professor and we were protected, but I put in a lot of work and that was certainly a highlight.

I did spend a year and a half as associate dean. This was the year after I came back from the year in Washington. David Hosford was the dean of Arts and Sciences, and he asked me if I was interested in becoming associate dean. I said, "All right, I'll give it a try." It was fun, but the thing was that I wanted to keep my research going too and he said, "Sure." He had no problem with that, but I was not smart enough to say, "I need funds to hire a post-doc who can keep my lab going," which other people have done, scientists. I just wasn't savvy enough to ask for that. I could tell, even though he had said, "Sure," that he kind of resented it if I was sitting in my dean's office and doing something that wasn't dean-related work. After a year and a half, I decided that was enough; I was going back to the lab. I learned a lot, and it was a happy time because one of my jobs was giving out computers to different departments. This is when PCs were new, and department offices were still dealing with the IBM Selectric typewriter. So, I was giving out computers to these departments, and they were very grateful. That was great fun.

Service, I was on a bunch of different committees, but there's not a highlight that comes to mind right now. I was on a review committee one year that oversaw complaints for people who didn't get tenure, and there was a sort of quasi-judicial process, where the complainant would come with somebody who would act as an attorney--although the person was just another faculty member--and then the administration had people. Then, we were sort of judging that, and I do remember for some of those people, we did find that they should have gotten tenure. I can't remember if we would be the final word on that or not, that if we said that this was unfair, that they were denied tenure, they really deserved it, I don't know if that meant that they would automatically get it. I don't remember, but I think it certainly would have helped in that appeal process. So, I think we played a role in getting tenure for some people who deserved it.

KR: What have your experiences been like over the past two years during the pandemic?

JW: It hasn't been as bad for me as it has been for a lot of other people. I certainly had been working from home before and continued to work from home, in this chair I'm sitting in right now, on the computer I'm talking to you with. It's nice that we have a summer house there in Springs to go to. When the pandemic was new--and we're living in New York City now--it was

a nervous time two years ago when it was very high level of infections in New York and New Jersey. A number of our friends from out there went out there in March instead of the usual time they would go out and sort of stayed there all year. We didn't do that. We did stay out longer than usual, but it felt much more relaxed out there and less tense being outdoors. Everything, of course, there also shut down. The first summer, there were no concerts or shows or art exhibits. There are normally a lot of art exhibits there and openings and stuff that's part of our summer out there; that didn't happen. Nothing happened that first summer, but we did go to the beach and sit on the beach and go swimming with the same group of people. We have a bunch of beach friends who we sit and talk with, some other faculty members at other universities and some psychologists and other people. That was the only sort of normal thing the first year, was the beach time with the beach friends.

What else? We missed going to theaters and concerts and missed performing--my husband and I both sing in choruses, and that didn't happen the first year. Last year was much better. Things began to open up. In the summer, we went to a theatrical production, an outdoor production. The family came to visit, and things were a lot better. We're waiting to see what happens with Omicron BA.2., what's going to happen here. In a normal year, we would do two or sometimes three oversea trips to interesting places, which didn't happen. We did take a road trip to Ohio last summer for a family event and took our son and our eleven-year-old granddaughter to Washington, D.C. during her Christmas holiday. That's all the traveling that we've had, but we have, on our calendar--and we have tickets--to go to Holland and Belgium in the latter half of May. That's all depending on what happens because they're having a little upsurge in Europe ahead of our upsurge of BA.2. So, it's not in concrete, but we're hoping to do that trip with another couple. That was originally planned for the spring of 2020. So, it didn't happen then, and it didn't happen in 2021. So, we're hoping--I mean, we've gotten to the point--we're further ahead now. We've got plane tickets purchased, but we haven't done anything else yet, so we're waiting.

KR: Well, I have reached the end of my questions.

JW: Okay.

KR: At this point, is there anything you would like to add?

JW: I'm sure I forgot stuff. There's no doubt that I didn't say some things that I should have that just didn't come to mind at the right time, but this has been two pretty long sessions and I think we probably have said a great [deal]. I know I talked a lot. [laughter]

KR: How does it sounds if I thank you on the record and then we will just talk for a couple of minutes off the record?

JW: Fine.

KR: Dr. Weis, thank you so much for doing this oral history interview.

JW: You're very welcome.

KR: Okay, let me stop here.

----------END OF TRANSCRIPT----------

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