Harry Yeh Oral History Interview, September 22, 2014

Title
“Furthering the Quest to Understand Tsunamis”

Date
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Location
Valley Library, Oregon State University.

Summary
In the interview, Yeh discusses his family background and upbringing in Japan, his early schooling in economics, the academic environment in which he worked while in Japan, and his decision to move to the United States. From there Yeh recounts the process by which he chose to change his name, classes that he took at UCLA, and his acceptance into Washington State University.

After sharing his memories of adjusting to Pullman and completing two degrees at WSU, Yeh describes the family circumstances that led him to take a job with Bechtel, Inc. in the San Francisco Bay area, rather than pursuing a doctorate at Colorado State University. He describes the engineering work that he conducted for Bechtel and then recalls his decision to begin Ph.D. studies at UC-Berkeley. In remembering his Berkeley experience, Yeh discusses his mentors, his initial research on diffusion-dispersion problems, his shift in focus to ocean waves, and the experience of writing his doctoral dissertation.

Yeh next describes his obtaining a faculty position at the University of Washington, his early wave work there, important colleagues and collaborators, and his move to research on tsunamis.

A major focus of the interview is Yeh's description of his field work surveying tsunamis, including his first experiences doing so in Nicaragua, the methods that were used, and later surveys conducted around the world. Yeh notes the uptick of interest and participation in the field that occurred throughout the 1990s. He then shares his personal experience of learning about the 2011 Tohoku tsunami, initially monitoring it from afar, and later traveling to Japan to conduct field work in Fukushima and elsewhere.

The session concludes with Yeh's memories of leaving Washington for OSU, his thoughts on the importance of the Hinsdale Wave Research facility, a description of his current research on theories of amplification in tsunami waves, and his hopes that academic research might be applied to prevent future tsunami disasters.

Interviewee
Harry Yeh

Interviewer
Chris Petersen

Website
http://scarc.library.oregonstate.edu/oh150/yeh/

Transcript

Chris Petersen: Okay, if you would please introduce yourself with your name, and today's date, and our location?

Harry Yeh: Okay. My name is Harry Yeh. Today is September 22nd, 2014. I'm at the library.

CP: Yeah. Well, we'll start with your childhood. You were born in Japan?

HY: Mm-hm.

CP: Where were you born?

HY: I was born in Japan, Tokyo.

CP: Is that where you were raised?

HY: Yes.

CP: What was your parents' backgrounds?

HY: That's difficult to say, but my father is from Taiwan, so that's why I have a Chinese last name. My mother is Japanese, from Kyoto, and I do not know how they met. So that's their background; they are not really educated. So.

CP: How did your father make his way to Japan from China?

HY: I do not know. I think he came to Japan during the war, and evidently he got married with my mother, and I was the third child. There were two older sisters.

CP: So you have two siblings?

HY: Yeah, mm-hm.

CP: What were you interested in as a child?

HY: Woo! Well, let's see, when you are a child you always think about what you want to be. The first thing I wanted to be is a shipbuilder, I think. I have no reasoning, just wanted to be a ship builder. And then, I do not recall, but sometimes I wanted to be a doctor, I suppose. Yeah, and then after that I got confused. [Laughs]

CP: [Laughs] What was Tokyo like to grow up in, as a city?

HY: Well, at that time, when I was a kid—I was born in 1950, so I was in Tokyo until 1972. But during that time is that the city is growing, and it is quite a bit different now, I guess. We have some sort of like—we tried to pick bugs. Some of those bugs—I remember, some of those bugs who live in the earth, which is what they call earth spider; we catch such kind of stuff. I guess we don't have such kind of stuff anymore. There is no ground in Tokyo, so all of those are paved. But, when I grew up at that time Tokyo was not a bad place. It was not that dirty when I was a wee kid. And when I was a college student, at that time Tokyo was very dirty in the air, and now it becomes clean again.

CP: Did you enjoy school, growing up?

HY: Enjoy school? Yeah, I had no problem about school. I went to a public elementary school, and in junior high on. I went to private school. So I did not worry too much about the entrance exam, and I did not get too much pressure as far as that goes, "You've got to pass the exam," kind of stuff.

CP: Do you remember when you first became interested in science as a boy?

HY: Hm. No, I guess not. Because I think if you see my background, I had the degree in economics. Oh, I have to be very careful, yes. When I was very young, I was very, very interested in getting and collecting the bugs and especially for the

bug fairs. And after that, also, my father took me out for the collection of rocks, that kind of geology type stuff. That was during my elementary school. And after I got into junior high, there was nothing for science, though, right? But during high school, let's see; it was a huge school. I don't know how many people. And all of my friends who wanted to go to economics, those kind of, for university. [0:05:00] Yeah, by the way, high school and university is linked together by the schools, so I didn't have to have an entrance exam. So that's why I went into economics.

But after I decided economics, I changed my mind and I wanted to go into engineering. At that time I could not, because of the sort of bureaucratic system in the Japanese university at that time. And I just could not because it was too late, so that's why I got into economics. And I went to university—I entered the university I think in 1968. That was not—1968 to '72 was not good years to everywhere in the world. In France, there's a program about the Quartier Latin. In Japan also there's a very intense student movement. So, most of the time I could not go to school. It's a quite interesting era. We did not have so much formal education, because there was not enough time to go to extras. So, but I did not join those student movements. I did not throw the rocks, and I didn't swing a stick, those kinds of stuff; I didn't do this.

But that means I had lots of time, lots of time, down time, to think about it. I did not go out and get a job during that time, so some down time, and I did lots of stuff, I guess. And it's a very interesting era during my college time. It's quite a bit different from now. If you see those students in the OSU campus, students are really trying to study, trying to learn. I definitely tried to learn and tried to study, but I could not. And so that's why I have to think about so many things. And after I got the degree—surprise, I graduated in spite of that, [laughs] in economics. And so there was lots of confusion in my mind during that time. I did not know what I want to be. I tried to get money and how living is not a first objective. I guess I'm more or less wealthy family, I suppose. I was not starved.

So I did not know what I wanted to be, but because of the student movements, I had lots of stuff going on, the flower generations, I always thought about I wanted to produce something from this earth. So I wanted to be a farmer. [Laughs] It's not easy to become a farmer in Japan because there is no land, and also I'm not Japanese in whole. I'm Chinese, but I don't speak Chinese. So, let's see. So, how can I become a farmer? That was the ideal situation for the Cultural Revolution for China. Everybody thought about it, and everybody was wrong. From hindsight, that era in China was terrible, which I did not know, of course. That kind of stuff, we thought about it.

So that's why I tried to come to this country, to learn another culture. So at that time my sister was in Los Angeles already, and she was married to a Chinese guy; my oldest sister is married to a Chinese guy, and living in Los Angeles. And she thought that she was Chinese. My second sister, older sister, married to a Japanese guy who lived in Japan, still lives in Japan; she thinks she's Japanese. I'm the one who's confused. [Laughs]

CP: [Laughs]

HY: I am, in some sense, as far as race is concerned, quite confused. [0:10:00] But anyway, so I wanted to become a farmer.

CP: Was there any farming in your background at all, any—your grandfather, father, or anything like that?

HY: I do not know, but I don't think so.

CP: What was your father's occupation?

HY: My father's occupation? He is a businessman. He does small stuff here and there, here and there. And he was quite successful in some sense; it's not big success. And that way he succeeds well. I think some people succeeded very well after the Second World War because they had huge opportunities. In his case it's not a big hit, but he's not really one of those losers. So he did really well. So that's why I went to the school and went to college. So that was good. And I, so, wanted to become a farmer. So I then visited my sister in Los Angeles, as I said. So I went to UCLA for summer school.

Oh, I have to go back a little bit. Right after I came to this country, in Los Angeles, that was 1972, and of course my English is a second language, and it's very difficult. The language is, some people learn it so easily; some people do not. Mastering a language is in my opinion so talented. It's also much effort! [Laughs] But anyway, so the first thing right away is I tried to learn English, in Los Angeles. If I think about the early 1970s, there is an adult school; it is an adult school now, too, in Los Angeles. So they are accommodating from Chicano people from South American, Central

America, and Mexico. So I went to that place, and I have to tell you, the tuition and registration fee was very cheap. It's a whopping 45 cents. [Laughs]

CP: [Laughs]

HY: Yes, only 45 cents! That's all it was. And the United States in the early '70s was so generous for the immigrants. They were accommodating immigrants. That's why this country is so rich by now. We're taking a different breed from different countries, and we invite as a society and economics, that's why this country is so economically, has been successful, by the way. So for the adult school, I remember the teachers. The first day in the school I have a Chinese name, and my passport—my name is written in Chinese on my passport. I should say, Chinese pronunciation written in the alphabet, which I could not read, because I don't speak Chinese. So that's actually—right now I can pronounce my first name, it's Hsiu-jen Yeh, and of course, the teacher could not pronounce my name. So she told me, "You have to pick an American name. Hank or Harry, pick one." [Laughs]

CP: [Laughs] Those were your options?

HY: That's what happened with Harry.

CP: Yeah.

HY: That's why my first name's Harry. But my name is also kind of funny though, because I was born in Japan, but my nationality is Taiwan, which I know, Taiwan is my name, I guess. And let's see. So when I was in elementary school, I had a Japanese family name and Japanese first name. The family name is Hayama, and my name is Hidehiko, so Hayama Hidehiko is my name. When I get into the junior high school, I guess my parents are told by the people in the school they must go international. As I said, I went to private school, so that's why I have a Chinese family name, and I kept the Japanese first name. That's the way it goes.

And then after I came to this—when I came to this country [0:15:00], now my family name actually changed; actually pronunciation changed. There's a Chinese character for the name, and that Chinese character, my last name is pronounced "Yo" in Japanese and "Yeh" in Chinese. So in the passport it says Yeh, Y-E-H. So then I had an official first name, Hsiu-jen, until I went to an adult school and it becomes Harry, but it was not official until Jimmy Carter changed my name in 1980. [Laughs] I was officially naturalized in 1980, I suppose. So that's what happened. I spent about, let's see, about five months or so in Los Angeles with UCLA. My background was not Science and Engineering, so I had to study Physics, Chemistry, and those kinds of stuff again. So as far as a college education is concerned, I took a detour.

CP: Were you still thinking about farming at this point?

HY: Oh, yeah, yeah. Yeah, I was thinking about farming. So I took Agricultural Engineering at Washington State University. I drove from Los Angeles to Pullman, Washington, by myself, using a '67 Volkswagen Bug. I spent, what, three or four days?

CP: How did you decide on Washington State?

HY: Well, that's the institution who accepted me.

CP: Ah.

HY: You see, if you imagine that my academic level was not that great, not that great in university. I was good in junior high school. In high school on, my grade is not that good because I was playing all that kind of—I played soccer in junior high school, in high school and those kinds of stuff. So, Washington State is the one who accepted me. I do not remember if I applied for Oregon State. Actually, there was Agricultural Engineering at Oregon State at that time. Right now they're called Bioengineering, or something like that. Yes. So, so that's why I went to Washington State.

CP: And what did you think of Pullman? You lived in Tokyo; you lived in Los Angeles.

HY: Oh. [Laughs] That was quite—I think for being culture shock, I think I conducted myself all right. Yeah, it's rolling hills, Pullman is hills. What a wonderful place, right? But when I drove up to Pullman that was in the beginning of September, so after they harvested the wheat, so they're tilling the ground, so it's more like a dust storm. So it was quite a bit different. When I drove along the Columbia River, that was quite a sight. It's amazing.

Yeah, and then I had a host family in Deer Park, Washington. I think, I had George and Judy Proofer, Deer Park, Washington. Just think about it; it's a real rural area, yeah. What an experience it was. They were very nice, and they made me feel comfortable, so that was nice indeed. So that's why I went to Washington State, was to try to become a farmer, and I redo the bachelor's degree.

CP: So tell me about sort of adjusting to college in the United States. From what you'd experienced in Japan, it sounds like it was pretty chaotic.

HY: I guess the chaotic part, or I should say change, is not the outside atmosphere, the outside environment. I think inside of me, as I said, encouraged in Japan, I had a lot of opportunity to go to school—actually, less opportunity to go to school, because school was locked out by police. So we went half of the time. [0:20:00] As I also said, I had lots of time to think, but at the same time I had almost no time to learn through all of this. So that really motivates me to learn something, I guess, after I came here. I studied a lot in Washington State. It's a completely different lifestyle, I guess. I drank a pot of coffee every night at 4 o'clock. I was studying very hard, and I was sleeping during the lecture. [Laughs]

CP: [Laughs]

HY: But then I, as I said, I have to learn from the Physics and Chemistry, Chemistry 105, Physics 101, and then Agricultural Engineering, so the engineering part was quite interesting. And I had a tractor laboratory, and I had to learn welding. You know, I tried to weld overhead; I burned my arm. And I was quite successful, I guess, as far as the grade was concerned in Agricultural Engineering. In my bachelor's program I was top of a class of three! [Laughs] It's Agricultural Engineering, there is not so many people there, only three people in the senior year, so. Because I got into the engineering and tractor stuff, so I was trying to get ready for the—well, at that time my desire to become a farmer is kind of vague, right, because I'd say the more I got into engineering. And I met a lady who I married, of course, and if she were a farm girl, then I was finding out there. She was not.

So, and let's see; how much should I tell about this? It's a puzzle of stuff, but I can tell some, but she has some medical problem. I think I have to tell you, because otherwise, this determined a lot of stuff, where I am, indeed. I married my first wife, and let's see. She had a medical problem, SLE, called Systemic Lupus Erythematosus. It's an autoimmune disease. And at that time, if you looked at the encyclopedia, it was a fatal disease. Everybody was afraid she was going to last about ten years. But those information was not correct, because the technology and knowledge in the medical world advanced every day. So anyway, but we spent lots of time in the hospital. We tried to do some kind of experimental treatment of those kinds of stuff in Spokane, Washington, and it was some hope.

And then after that, I married and graduated with a bachelor's degree, and I tried to get some job from an outside company in consulting engineering, and I sent out about ten written letters with resume, and everything failed. So I went to a graduate school in Washington State University, in Agricultural Engineering, and so I got the master's degree for doing—you make a simulation in the groundwater and drainage problem. And then, okay, after this, I wanted to go to a PhD degree in Agricultural Engineering, and I applied to several places, and I was accepted at Colorado State University. That was one of the better ones, especially with—I tried to do drainage work, farm drainage work, and that was one of the best.

And I remember Professor Dow Simmons [0:25:01], Fort Collins, he's the one who gave me a GRA, and I was just about to go in there. We found there is no medical insurance which covers the preexisting disease. Not only for that—I think at that time there was no medical insurance for a spouse. So that was a serious problem for us. So right now, Barack Obama is talking about insurance issues; I totally understand what's going on. I mean, right or wrong, or regardless, I went through this, and if you really think about this, this United States, as far as medical insurance is concerned, this is a third world country. But anyway, so I had to give up for this.

So I went to Fort Collins to see him, actually, in person, to apologize to Professor Simmons. And after I go back to Washington State, I have to do something. So one of my professors in Washington State in Civil Engineering, who taught

me fluid dynamics, I think, I went—yeah, I went to see him and explained to him, you know, I need insurance. [Laughs] And so I need a job in some sense, so I can get protected for that aspect. He picked up the phone in front of me, and called up Mr. Rex Elder in Bechtel Corporation, and talked about me. And a week later I had an interview in SeaTac Airport, and I got the job. So lucky, you know. As I said, after I got the bachelor's degree, I sent out ten or fifteen letters and CV; I had no success at all. This time I didn't do anything, I got the job. It was great!

Incidentally Rex Elder, he's an OSU graduate, actually he is an Oregon Stater, as they are called. He's an Oregon Stater. He is my immediate boss. Of course, I didn't know Oregon State, those kinds of stuff at that time. So that's why I got the job in Bechtel, San Francisco.

CP: And what was that job?

HY: It's Bechtel Corporation, a large construction company, and the company's so large, so there's some sections that have their own consulting sections. And my section is H & H, which is Hydraulics and Hydrology, a very special group of people. Let's see, do I recall? Maybe fifteen people, maybe ten, twelve people, and more than half of the people had a PhD in the engineering practice. In the 1970s—no, they got it in 1970s. So it's a special company, and I started at the company, at that place. I started to work at Bechtel in, what, 1977 or '78, after I did the master's degree.

And most of the work which we did is international work, and also national work, and I guess probably one-third, close to half or one-third of the work is nuclear power plants. It's before Three Mile Island, so you know, we did some recirculating water systems, those nuclear power safety systems, and those kinds of stuff, which I did. And my first work was dredging on the river, so that they could make a small power plant for the mining operations in Borneo. In the first week I had to do this, and I was told that I have to run some program called Hec 2; I guess they call it Res in these days, [unclear] for the numerical code. And I had to, the first week I had to do overtime. [0:30:03] But it's quite an experience.

I learned a lot, actually, in some sense, but I could not stay there too long. Jokingly or seriously, I do not know myself, but I couldn't stand wearing a tie. [Laughs] It was nice routine work. I shouldn't say routine work. I had to wake up at about 6:30 in the morning, take a 7:10 bus, and every time—I was living in Marin County, and I had a very small house in Marin County. And taking a bus, taking a ferry, every morning and every evening, you feel great going across the Golden Gate Bridge. Wonderful bridge! It feels really good, that place. But anyway, so I was working at Bechtel for two years? Let's see, how many years did I—? I don't even remember, but two full years, I suppose. And after that I was also at Bechtel, I can talk about after I have a sip of coffee. [Laughs]

So that's the background. As I said, half, more than half the people have a PhD, and some of the people are really very capable people. In that sense I was quite lucky. I think the moment Professor Robertson of Washington State University, in Civil Engineering, picked up the phone with Bechtel and talked to Rex Helder, my luck changed. I got so lucky after that. And if people around me are some who have helped me, I do not know, but it's really amazing in some sense. Yeah. In Bechtel, as I said, at Bechtel I guess I spent two full years, and ran some of the actual engineering, writing reports, some computations, and I learned. Even this complex work which I have to calculate, my boss already knows the answer. That kind of stuff, I learned. And those kinds of estimates and intuitions, I tried to pinpoint important factors. You never learn until you really work with excellent people. And that kind of concept, actually, I try to teach students here, but I don't know how much I can get that across. Yeah, but anyway.

So I did lots of working back there in my—oh, yeah, let's see. That's before or after? I think before. Yeah, it must have been before. Okay, toward the end of my tenure for full-time work in Bechtel, I was assigned to be a watchdog for the laboratory test, performing at Escondido, California, near San Diego. That test was at Diablo Canyon, intake structures; there's nothing to hide on that. The Diablo Canyon at that time was a real problem, because they cannot get their license from the NRC because of the huge mistake they made. So PG&E California, they asked Bechtel right next door to do some higher level experiments for intake structures for the safety check. And that small subcontracter was doing experiments, and I was the one who was gonna be the watchdog.

And yeah, I think at that time I met a consultant, Professor Frank Reichley from Caltech. He retired a few years ago. That was the first time I met him, and since then he and I, I guess, sometimes worked together and contacting all the time. [0:35:02] That was good relations on this. But anyway, so Diablo Canyon was studied, so we did those kind of laboratory experiments. And I also met a few people when I was consulting, Bill Grosskopf, who is doing still some consulting by

himself. From time to time I talk to him. He is also a good one. There is two other people. Let's see, I just don't remember—Mr. Beneke and Cox. I still don't remember. [Laughs] Yeah, and there are other people.

This study, for the laboratory study is really very interesting. It really was important for the laboratory experiments, even for the testing. You know, Professor Reichley is a very detailed man, very careful, and that's the way it should be for the professional. And those kinds of attitudes also I learned from him. But anyway, meanwhile, so at that time I had to go to San Diego every week, right? The first time I always thought it was also my colleague, my boss, Pat Ryan. Pat Ryan was also at Bechtel. He's the one who assigned me to go to Escondido for these laboratory experiments, laboratory tests. So first step, that's good. I can get to go to San Diego, for everything is paid. So I leave San Francisco Monday; come back either, I guess Friday, come back on Friday, every week.

CP: [Laughs]

HY: Get sick and tired of this. I have to stay in a hotel, yeah, so that was tough. But at that time that was not too bad, I tell you. Travelling, air travel from San Francisco to San Diego is not that bad at all. You can go there about two minutes before, and hop into the plane. I didn't have any security or anything else. But now I cannot do this.

CP: Yeah.

HY: It's just incredible! But I remember that. You just go there right on time, and just hop in there, so that's what happened with this. But anyway, so after those kinds of work at Bechtel, and as I said, I just don't want to wear a tie all the time, I wanted to go back to school. But there was still an issue, right, for the medical issues, and I also had a house. I did not have a house, by the way. The bank has a house and I paid to live in this. [Laughs] So anyway, so I wanted to go back to school. So one of the natural choices is going back to Washington State, for Professor Robertson in Civil Engineering. And he gave me a GRA in that stuff doing some kinds of hydraulics.

So I was thinking of going back there, but there is another school nearby with Marin County, which was UC Berkeley. It was also right there. And I did not know about UC Berkeley, [laughs] because I just went to Washington State, that's the course. One of the reasons, right next to the, across the bay. But one of the professors, Hugo Fischer, Professor Hugo Fischer, is the one who sent me a letter, and in some sense he recruited me, because of the connection with Bechtel. I don't know. And they gave me a fellowship, one of the top fellowships, called the Chancellor's Fellowship in UC Berkeley. That's nice, right? It carried no stipend.

CP: [Laughs]

HY: [Laughs] Well, the reason for that? Usually they carried a stipend, I'm quite sure [0:40:00], because today it's one of the highest honors of the fellowship in this sense. But it carries no stipend, because I had a house. And after that, I think I called Professor Fischer, "I cannot go without any stipend. My expenses having items—I don't have a house, the bank has one. And also, I have to feed my wife and the dog." I had a small whippet. Cute dog, but anyway, so then Professor Fischer must have worked on that, and I got the Lucille Smith—Lucille? Let's see, Joseph and Lucille Smith Scholarship at UC Berkeley. Two year scholarship, rather, one year. The amount of the money is not that good, but I can still survive. So, that's the reason I went to UC Berkeley, because I already owned a house, and then I got the scholarship, and I had still some issues, bank issues, so I had to work at Bechtel.

So I worked at Bechtel every year for four months, full-time four months, while I went to school. And at that time my wife was working at an insurance company. Was it Safeco Insurance? I don't remember if it was Safeco—some kind of insurance company in Marin County. There's a big one opening, [unclear]. But anyway, she was working full-time, but my salary in four months was bigger than hers. Oh, maybe that was the time I went to Escondido. Maybe that's it. Maybe I was just, that I was—it must be, it must be. I was working at UC Berkeley. I went to UC Berkeley and at the same time I was working for Bechtel, and I was a watchdog in Escondido. Let's see; where am I? Yeah, for UC Berkeley, that was an interesting experience. That place was, I don't know now, was quite a bit different from Washington State.

CP: I'm sure.

HY: It's not because of the professors. Professors are the same. Peers, peers are different. I mean, that makes a different academic environment. Well, I was not living in Berkeley, I was in Marin, so I had to commute all of the time from there.

But still, there is a person from, like, New Zealand, and Iran, Greece, and those kinds of people. And I had a—one from Australia, he's a domestic UC Berkeley, son of a UC Berkeley professor. We can make real vivid discussions; right or wrong is a different story. We also did a paper chase, just literally a paper chase. One of the aging math class, he gave us a homework problem called try to solve the problem using a Weiner-Hopf Transformation. Nobody knows what a Weiner-Hopf Transformation is, although he explained it with the class, not that we could get it. It was a paper chase. Everybody went to the library. I guess I was the one who found it! [Laughs] So those kinds of stuff, right? And then we have, we always have lounge, student lounge academic discussions, big discussions on this.

But as I said, the difference is because of the peers at that time in the 1970s. Interestingly, all of the graduates become quite successful, where they got some job in academia. Steve Monismith, he is a professor at Stanford. Greg Lawrence is also a professor at the University of British Columbia, and those kinds of things. We all entered at about the same time and graduated about the same time. [0:45:01] Yeah. So anyway, during the time I had to work in Bechtel trying to get the medical insurance. And by the way, I had to pay for medical insurance, 500 or 600 dollars. At that time, it was expensive at that time. And tuition fees is, I think I'm talking about 300 or 400 dollars at that time. Quite a bit different, these! [Laughs]

CP: Yeah.

HY: It was so inexpensive these days. Yeah, but even 300 or 400 dollars was tough at that time, 1970s and 1980s. And then Hugo Fischer, I was working with Professor Fischer about diffusion, dispersion problems, how stuff diffuses in the coastal environment. It's quite a bit different from agricultural engineering, because the area changed when I got the job at Bechtel. At Bechtel I did hydraulic engineering, and during that time I got the PE License, Professional Engineering License for the civil engineering, not the agricultural. But anyway, so first two years—is it two years? Yeah, first two years I was working with Professor Fischer. I remember he gave me one-on-one tutoring. I had to read a paper, and explain to him every week, because he doesn't want to read it. [Laughs]

CP: [Laughs]

HY: No, I'm just kidding on this. But you know, he did such kind of stuff, just once a week, but still it's nice things to do. I used to do that when I came to OSU, the first two or three years. I haven't done that these days. I think I should do it to my students. That is a very nice thing to do. Yeah. Well anyway, so I was working the diffusion-dispersion problems, and he also did quite interesting stuff. His PhD work, Professor Fischer's PhD—by the way, he went to Caltech. He was an ROTC student, and he is what they call a Boomer or Zoomer? [Laughs] Air Force.

CP: Okay.

HY: Yeah. So, his hobby is soaring glider competitions; he does compete. But anyway, so, after two years I did diffusion-dispersion problem kind of stuff, background work, he could not get money to support me. And so he told me, he asked me to ask some other professors. It's very ill-motivated for this! [Laughs] Try to get a topic, research topic, because of the financial needs. I don't like it, but that's the way I did. These days, for PhD students that's a regular—yeah, at that time, well, I guess tuition was different, I guess. I had to support my wife and dog. So I just tried to finish up the program quickly. And then I met Professor Hammack, although I took his class before. Professor Hammack is also a graduate from Caltech. There were lots of Caltech people in UC Berkeley at that time. Actually, all three of them, the professors—Professor Hammack is the one who gave me a research idea. And he said—I think he supported me on the idea. [0:50:01] Yeah, I think he did. So that's why I took his work.

That was the first time I got into the area of ocean waves. He was trying to do some work on edge waves, which is waves propagating on the shore. And the laboratory experiments are already—laboratory set-up is already made; it's a pretty big one in the Richmond Field Stations. It's quite interesting, and Professor Hammack is a real academician. It's not—well, it's engineering, of course, but it's more like mechanics. I learned a lot from him, for the attitude, for that kind of stuff. So with this I'm trying to make edge waves, how a wave changes as it propagates, trying to do some evolutions of the wave form.

And at that time wave evolution is one of the emerging topics in the mathematician and physicians. In the 1960s, late 1960s starting, on, they're talking about the wave form does not change, the harmony of the wave forms, with water

waves. It is a theory, and how waves interact with those theories, and that kind of stuff. And they started doing some kinds of laboratory experiments. That kind of topic is the one he was very interested in. And so there is lots of different kinds of equations: the Kortweg-de Vries Equation, and the KP Equation, and the Nonlinear Schrödinger Equation, and so on and so forth. Professor Hammack said, if I find the evolution equations, I can put my name on it. So I hear them talk about this maybe two or three times, at the very beginning of my association with Professor Hammack. And he quit!

CP: [Laughs]

HY: He is the man; he is a real academician. He is very, a perfectionist. He simply cannot stand red tape in UC Berkeley. And for that, I think he is a great man. He left for—where did he go? He left for Florida. So I only had a discussion three or four times, and so I am alone on that. The first year I was supported. The following year, before the following year, and let's see; because he left suddenly and I am the only PhD student of his, and I have to do laboratory experiments in Richmond Field Stations, all of the professors said, "Oh, poor Harry." [Laughs] That was a big advantage.

CP: [Laughs]

HY: Now I could do the things I wanted to do, and I got the support. I need a hundred dollars here, I need two hundred dollars here, I need—can you afford it? I get those stuff. And then best of all, right next to the laboratory in Richmond Field Station, civil engineering, there's a naval architect's test laboratory. So they are separate. I'm quite sure because of the professors not present, they let me use their data acquisition system. Now at that that time, a data acquisition system is a big deal, and you cannot bring one place to the other, so I have to put the cable from one place to the other. So I got those kinds of support. And then after that, I found the evolution equations. That equation is now named after me. [Laughs] Because at that time three people, two other people, found the same equation, so that means that's good, so that my derivation was right. Well, it comes out to be the same formula as another [unclear] equation, so they are the coefficients. So that was good. Yeah.

And when they write the PhD thesis? Well, let's see. Let's see, let's see. There was no word processor? [Clicks tongue] I guess not. We needed to use a typewriter. [0:55:00] And before a typewriter, I just wrote by hand. I write by hand. My wife then looked at this; she threw it away [laughs] twice or three times. It's no good, so I have to write again. She's a native English-speaking person, so not that English only, but it's not easy to write.

CP: Yeah.

HY: But she hated my thesis, after she threw it away a few times. [Laughs] And then after that I went to see Professor Hammack at the University of Florida in Gainesville. He wrote, rewrote everything, right? That's the way he is. He is the man who rewrites Shakespeare. [Laughs]

CP: [Laughs]

HY: There is such kind of people, always. So after he rewrites, I rewrite back. [Laughs] I did! Not everywhere, of course. And so I got the thesis done, and after the thesis is toward the end, I guess that's the end for UC Berkeley. There is no finance, so. And two weeks later, or something like this, two weeks later, Professor Fischer, he is the one who told me, "Congratulations, Dr. Yeh." That was a very nice thing to say—and a week later he died. As I said, he was doing soaring glider competitions. He had a mid-air collision and never—it's incredible. He was very, very young, probably 45 or 46 at that time.

He was also a, you know—I also learned a lot from Hugo Fischer. As I said, he got a PhD degree in Caltech, and what he did is substance dispersion program in the river, and tried to get how substance disperses in the river flow. And he told me one time, well he told everyone, there is a classic work by G. I. Taylor for substance dispersion in the pipe flow, so you just need to change the pipe flow to an open channel flow. It becomes a PhD thesis. [Laughs] It is, and you know, some great work is already done, but some of the specific applications, now. But pipe flow and open channel flow is quite a bit different. So he is a very, very smart guy in that. So, after Hugo died, and I got a degree, and I got the job!

CP: At the University of Washington?

HY: Yeah, that was also incredible. I applied to only one place, right before the thesis. That was—1983 is the year I went to Washington, but in 1982 there was an ad for, they were looking for an assistant professor, in the student lounge, and some other places too, University of Guam, also. The University of Washington, and I thought Seattle, Washington, and the University of Washington, is a good place for the medical treatment, since there is a big medical school. I don't know if it's good; that's a different story, but one of the leading institutions for the medical world. So that's one of the very strong motivations to apply to that place. And I applied in 1982—'82? Maybe early 1982; I don't know when I applied. And yeah, I interviewed. Well, I got the interview. So that means I'm quite sure Professor Fischer [1:00:00], before he died, he must have wrote a very nice reference letter. Yeah. So I went to the interview. It was drenching rain there, in Seattle. I wonder why? [Laughs]

CP: [Laughs]

HY: And yes, and then I gave a talk. I gave a talk, and I had a very, very good comment from Professor Collin Brown, if you know him? He was here; he died a few months ago. He retired from the University of Washington and moved to Corvallis. He was affiliated with our school. He comes to our school quite often to visit the son of a faculty here, of a child. He came to my place quite often, and I certainly enjoyed him. But he gave me a very good comment after I gave a talk in 1982, during when he taught there. And I was hired. So as I say, I'm so lucky. But I didn't struggle as far as getting a job and those kind of stuff, and I was helped by so many people I suppose, too.

CP: So what was this new position?

HY: Assistant professor at the University of Washington.

CP: Mm-hm?

HY: Yeah, I started in 1983.

CP: In Civil Engineering, is that?

HY: Civil Engineering, and assistant professor at that time was quite a bit different from now. There is no is no assistance. [Laughs] You know, if you get a job as assistant professor you yourself are alone. You have to structure it by yourself, and we have to teach I think five classes a year. And not so much demand for getting the money type of stuff. But they must have demanded publishing some papers. During the interview I was told by the chair of the department he expected me to publish about ten papers a year.

CP: [Laughs]

HY: I told him, "I will not." [Laughs] They still hired me! They still hired me, so that's why it's totally not those kind of stuff. [Laughs] But, yeah. I expected that if you're going to do some kind of computer modeling or something, you might be able to do it. But if you do not have the experience, it's not that easy to do. And I totally know that, that requirement, I shouldn't set high expectations. But anyway, at that time the situation was quite a bit different. Assistant professor is back by himself. I have to develop my coursework by myself. There is no formal mentor. There was an informal mentor. I had one at the University of Washington. I don't think a real mentor and that kind of stuff, but he'd come to my office or I'd go to his office, or whichever for quite a long time, Professor Steven Burgess. He is a hydrology person. He also helped me a lot on this, my career. And I think he helped me because he looked—he reviewed my first proposal to the NSF. The NSF was also financing all of this.

But anyway, so you start establishing your coursework by yourself; that's what I did. You have to get a research program, and you have to get some kind of students. Yeah. So it's a different kind of pressure, I suppose. Nowadays as assistant professor, you have to publish a paper; you have to get money, no matter what kind of money it is. [1:05:00] And you have to establish yourself, and you have to be famous, I suppose. But, it's a different kind of situation, it's alright. The teaching load is quite a bit different, too. Let's see, where am I?

CP: So how did your research get established, and how did that sort of progress?

HY: Oh, good point. Okay. I was told to go to Washington, DC, to meet some people. That's the only thing we do here. And I think this is good, because I was a little stale, I think. So I went to the NSF. At that time that was on K Street, a different NSF. With the NSF, and the ONR—then I went to the ONR at the same time as them. With the NSF there is a program officer. It is quite a bit different at the NSF at that time, and at the program officer that—I forgot his name. Is his name Thermanack? No. It's a guy; just now I forgot his name. But he told me if I wanted to become—if I wanted to get the institutional grant, a research institutional grant, or just a career grant, presidential, business grant kind of stuff, or regular grant, he told me pick one. [Laughs]

There was a big expansion in those kind of stuff, but I had an Initiation Grant, Research Initiation Grant from the NSF, two years. I guess it was about 50k or 60k. That was a good grant to start on something. And then after that, I got quite good money from ONR. ONR is also quite an interesting one, because I guess my connection to ONR must be through Professor Hammack. And then Allen Grant is that guy. I think he is a professor in—I think he is at Johns Hopkins. But he is the one who is program officer. He gave me a quite large sum of the money, large at that time, 200 to 300k. I could make a very unique wave basin, and with this I'm trying to do some kind of fundamental research with a wave-maker.

And after Allen Grant moved to academia, there is another guy who followed this project, and at that time I approached this end. Part of the reason is it's not mainstream, minus all the mechanics and the fundamental kind of stuff, people do not see the immediate benefit. There's lots of benefits. So since then, I guess that particular program is more interested in the field work. So that's what happened. So after that I don't think I had any money from ONR. On the other hand, with NSF, I have been quite successful at NSF until—I should say until about [clicks tongue] ten years ago.

There is a guy, Cliff Oxdale; he also died, deceased. I first met him at an NSF-sponsored workshop at the Indiana Institute of Technology, IIT. I do not remember exactly what his subject was. He gave a talk, he talked to me, and then he more or less continually supported me throughout. That means somebody else wasn't supported. [Laughs] That was bad. And then he was—well, by that time, mainstream of the work, of the NSF-funded work, is individual research. That's the way it was, especially for the engineering. [1:10:00] Individual physicists. But he was the one who tried to put together to make a group, and I guess more or less the first one was, I was connected to Professor Philip Liu at Cornell University. And then I was also connected to professor Costas Synolakis—he is at USC, University of Southern California—all three get together, trying to make a group proposal.

I guess this is one of the sort of pioneering research proposals, collaborative proposals. And Cliff also tried to include some other people to our group. One of those are George Carrier at Harvard University. He is more like an applied mathematician with a background in mechanical engineering. And later on, I had a real privilege to work with him, Professor George Carrier. We published two papers after he died. And he was a big guy in the area. Without this kind of research project, I guess I never would have the opportunity to talk to him. That may not be true, because I went to the tsunami workshop in Hawaii. I remember at that time his wife told me he received a presidential medal, whatever it is. She said he's going to receive a presidential medal.

CP: Hm.

HY: And I think I told his wife, "That means he has to wear a tuxedo, right?"

CP: [Laughs]

HY: [Laughs] Maybe he doesn't want to. But he did.

CP: So this collaborative proposal that you mentioned, was that the beginning of the tsunami work?

HY: Yeah. Yeah, it is. Actually it's not. The beginning of the tsunami work is my initiation grant. Let's just go back a little bit, okay? Right after I joined the faculty at the University of Washington in Civil Engineering, I was thinking of something, doing edge waves or something, that kind of stuff. At that time the school head told me, "Hey, why don't you do some tsunami work?" So he suggested doing tsunami work. That was interesting. So that's the topic with me, when I went to Washington, D.C., I guess. And during that time I recall I also visited Philip Liu, Professor Philip Liu at Cornell. I called him up from Washington, DC. He says, "Oh, it's so close! Come on over!" It's not close. I had to fly to Syracuse, and Syracuse to Ithaca, and then I had to take a bus. I spent—oh, he gave me lunch, so that's okay.

CP: [Laughs]

HY: I made a day trip from the DC area to Ithaca. And he was the one, "Oh, they have a Tsunami Symposium in Victoria, Canada." [Clicks tongue] 1986; I suppose. It was '85 or '86. "So Harry, why don't you go there, all right?" That's what he told me. So I went there; so I met lots of people. He didn't come, by the way. [Laughs] Lots of people I met in Victoria, Canada. That was the first time I was at a Tsunami Symposium. I am quite sure at that time I already had the initiation grant, which was talking about tsunami grant initiation, yeah. And let's see; the Tsunami Symposium is the one; I met the active players on tsunamis from all over the world, a group of about fifteen to sixteen people coming; it was quite small, very small. [1:15:00]

And I met a few people. Professor Shuto; he retired. He's a Japanese guy; that's the first time I met him. He's one of the big guys in tsunami, and he also got the medal from the emperor, the Japanese Emperor. Anyway, he looked after me all the time. He taught me so many things, interesting things. Yeah. Anyway, so that's the time I started with the tsunami work. And my tsunami work is doing some experiments, and some other stuff. Tsunami work—I can talk about tsunami work, our field survey.

CP: Yeah.

HY: Okay, I knew there was a tsunami in 1980. [Clicks tongue] Three. 1983, of course, 1983. Japan had seen tsunamis. So that was okay. So I just saw it, and then some other stuff after that; Mount Saint Helens—before that, before Mount Saint Helens erupted. But anyway, 1992, I guess 1992, Christmas time—it's always something at Christmas time. No, no, no, that's not true; 1992 in September, there is a large tsunami in Nicaragua, and that was a real—as I said the first one was 1983 to 1992. That was a very, very quite period. So in 1992 in September, there is the Nicaragua tsunami, and I thought this was a real once-in-a-lifetime opportunity to do survey. So we, Professor Costas Synolakis, and I, and a guy from Norway, and some other people came together, and coordinated with the Japanese people and Nicaraguan people to do a survey. So this is the very beginning of sort of an organized international tsunami survey. Nicaragua is very interested in this.

So we went there, and this was my first time when I saw the site. In one of the towns called El Transito, I think several hundred people died. But anyway, you know, a tsunami site is quite a bit different from the earthquake site. An earthquake is shaking the place. So, it's destroyed buildings or something; rubble just remains there. A tsunami it all sweeps over; it becomes empty. And I met the people who were evacuating up on the hill, and that kind of stuff, and it makes me feel something, right? Because you get involved. You get involved to do something, and just like—although I'm doing some kind mechanics, that kind of stuff, there is some connections within me, within results; some bridges were there.

And so that's really something. That was the very beginning of tsunami—that was the very beginning of the use of GPS, hand-held GPS. And I'd never seen this GPS at that time. The Japanese people brought GPS, but he didn't use it. Most of the study was done by map and other stuff.

CP: What were you surveying?

HY: What we're surveying is the wave path, okay? Very difficult to model tsunami's wave path; it's still quite difficult now. A tsunami is such a mysterious thing. The generations occurred at the bottom of the ocean, and nobody knows what kind of displacement happened, unless you solve it in detail, before and after. I never worked as—we did not learn anything about under the water. [1:20:01] We knew much more in the training in the models, and so you know that. And so, the generation process is not known. And I guess in 1960s, we tried to make the numerical model, plus we tried to make some kind of improvement. So with the model, you have to have the generation point kind of stuff, and we need to know what's going on at the bottom.

And the interesting thing with a tsunami is you have a wave length so long, so you simply cannot do laboratory experiments. Laboratory experiments to deal with some kind of tsunami one meter long, you have to have sort of a few millimeters of the depth. You cannot create such kind of waves. So that's why field data is so important. So in the dynamics of a tsunami, hydrodynamics of it, behaviors and characteristics, the first thing you need to know is how much the wave is going up; that's the main thing. So, at that time, there is no structure engineer; there is no geologic engineer.

When you have people do the survey, it's a seismologist, and the hydraulic engineers. Those are the two main people. Some other people work in social science—social science some, not so much. But there is a person, Jane Prouse [?]. She does not belong to the university, she's just working by herself. But again, she is an urban planner rather than social scientist. She comes. And I guess that's it, maybe. And so that's what happened in Nicaragua.

That same year, in Christmas time, there is another big earthquake in Flores Island in Indonesia. It's a once-in-a-lifetime opportunity. [Laughs] So we went to Flores Island, and I witnessed the run up of water of 25 meters or 28 meters. Everything is gone; vegetation is gone. It's just an incredible sight. Again, for that place we set up a recorder measuring the run-up height. The actual measurement is done by those hand levels and stuff for 28 meters. How did I do it? That's the way—it's not the way these days. We have a radar rangefinder kind of stuff. We don't have such kind of stuff, but that's okay. And after that, I have so many different tsunamis, and lots of arguments.

And as far as the tsunami is concerned, it's a small community; mainly hydrodynamics and seismology is the way to study the tsunamis until 2004. The Indian Ocean tsunami, that's big stuff. Indian Ocean tsunami is the one, I guess 230,000 people perished, I suppose. The aftermath was huge because of human lives lost. So after that, lots of people got into the area of tsunami research, including structural engineers, and some other coastal engineers who were not interested before. And that's a good thing, for different kind of viewpoints. Yeah, but sometimes there's a good part and a bad part, I guess. We who worked in tsunamis at the very beginning had been through so many different things, discussed tsunamis as quite a bit different from the other stuff, in terms of discipline. We've tried to model tsunamis for one meter. It's almost impossible; it's just not the floor, it's not the waves.

But some people who got into this topic in 2004, who have different kinds of expertise, do not do the recording of such kind of characteristics. So they do the work a different way. I do not say it's a waste, but it's a little bit different. Since 2004, I think there is a lot of such research has been done. [1:25:00] It's not, well, I should be careful. It's not directly related to tsunami simulations. And to try to extrapolate those results to predicting tsunamis is fine, but you have to know, you have to recognize the uncertainties and the errors. It's not like an extension of coastal engineering. It's not the extension of that laboratory engineering. Laboratory engineering has practiced, and they have established a manner to model, established a manner to predict, and some people think about that's the way we should extend to use for the tsunamis. Maybe that's okay. That maybe is the way we're supposed to do it, but yet the people have to recognize that it's a different creature. So there are some uncertainties, and you have to be careful, so.

That's what happened after 2004. Lots of people got in this area, and I became no longer an expert. [Laughs] Probably not, but I did talk to lots of people on tsunamis, discussing tsunamis, Japanese people and other places, and different people have different opinions, and there is lots of uncertainties. While tsunamis—as I said, a tsunami happens very rarely, and the length scale and time scale is very unusual, so you simply cannot extrapolate your understanding of tsunamis. In that case, you have to travel. So lots of surprises. So that's why I get still very interested in tsunamis. One example of that is at Flores Island. There's an island called Babi Island right next to Flores', more critical island. And there's Flores in the front; behind there's a straight between Babi Island and Flores Island, so in the straight it's always calm, because the shadows from Flores brought wind and the wave shadows. So there's two fishing villages. And Flores Island is both an Islamic and a Christian society. One of those is an Islamic village, the other one is a Christian village; both are wiped out. They're supposed to be protected. They're supposed to be protected, and it's wiped out.

And if you have a very, very long wave, like a tide, and you have about two or three meters in diameter island here, if it's very long waves, simply whatever is going up and down; nothing happens. If it's shorter waves, like wind waves, like a wavelength near 200 or 300 meters long, big, violent waves, this island, this coral reef, it will divert to the island and breaks, and you'll have some calm zones behind. The tsunami is sort of an intermediate, so it's sneaks, split on both sides, sneaking behind, and much a bigger wave pops up. And those kinds of stuff, if you have some kind of experience from coastal engineering type of stuff, you have to be very careful with this. So, that's all technical stuff. That's what I did.

So those are tsunamis, and 2004 lots of other people get in. There's good things about—I say some bad things, but then sometimes I'm critical. But that's okay, considering more people work, and I think it's going to be more progress, but differently. And then 2011 comes. Okay, 2008, maybe I should just tell you my experience, I guess. That particular night—I have just to say one thing, though. My previous wife died, so I remarried. [1:30:00] So the second wife is from Japan, and she was a classmate in the 1970s. So she was a Japanese person who, she came to Corvallis about ten years ago. And she doesn't speak—well, she does speak English. She knows English, but she doesn't want to.

CP: [Laughs]

HY: That's the way she is. [Laughs] Oh, no! I was told by her yesterday, or last night, never tell about this. [Laughs] Well, never mind. But anyway, so she and I had a special TV channel called TV Japan; you have to pay. I was watching on that particular night as it was talking about this. What can I say about? It was it 10 o'clock or 11 o'clock in the evening, where we wanted to—it must have been 10 o'clock. We wanted to watch—yes, we wanted to watch a cooking show, an eating and cooking show, Japanese food. And I turned on the TV, and it's maybe just two or three o'clock, right, and it happened when—oh, okay, so it's wintertime, so it must be before 10 o'clock, yeah, before 10 o'clock.

Around 9:50 I turned on the TV, I guess. There's a news program—big earthquake. There's no tsunami yet, but the tsunami warning was issued in the NHK. I was watching all the time, until, I don't know, about 2 o'clock or 3 o'clock in the evening, so I sort of tried to record the arriving time of the tsunami, and all that kind of stuff. Most of the Japanese people, in Japan, they go and do this. So that's the first time I saw those tsunamis, and the first part was not that obvious when I saw it. Just the regular inundations, until they showed that the big tsunami is advancing on the Sendai Plains.

And then after this, so the tsunami community tried to form an international team to do a survey, because a tsunami is not really one country's business; a tsunami propagates. As a matter of fact, you have damage in the West Coast and Hawaii, and some damage in Chile. So I think we traditionally, we always did some international cooperation and that kind of stuff. And that's the way we did it in Indonesia, and everywhere. But this time the event was so big, so many people have a real problem. So an immediate survey was not that formation, but at the same time, selfishly we are frustrated because we wanted to go to see, and try to get this group, try to continue to find what's happened.

Because a tsunami is so large, especially in Japan, we have a window. In normal case, within two weeks the place is cleaned up. But, let's see, it was not two weeks later. I think I got in—I think it's the first or second week of April, by joining a team with people in California peers, structural engineering kind of stuff. And my colleague, Hermann Fritz from Georgia Tech, he was ahead of me by two days before. We were one of the first ones who get there. So the first trip is just going, and the survey? We don't measure it. Two days or three days we come back, and before that, during—before I went to the survey [1:35:00], I did talk to Japanese people, especially for Professor Shuto, because he was retired and he doesn't go to the survey. So we talked about this back and forth, some e-mail discussions. You also have Google pictures, and those images come out immediately so I can actually see that.

So that's what happened, and the scene there is—I never saw such kind of stuff before, because it's a really developed community, and one of the surprising parts is that; I have to be very careful, because the first survey, yes, the first survey was—yeah, it's an extent of the damage. And then also, we always thought any well-engineered, reinforced concrete structure, or reinforced concrete building would stand the tsunami forces. We were wrong. And at that time we were eye witnesses that some of those buildings failed by rotation. So that's—that's a real eye-opening experience. So that's what happened, the first survey, and I got some ideas. After that, there were so many people who went there.

I had a sabbatical leave in Japan. I was planning to do that even before that, yeah, that year, I guess. Yeah, that's March—that's right, March, year of 2011. So I had a sabbatical leave for 2011 and 2012; that's it. And I was already making arrangements with one of the guys at the University of Tokyo. And I had some support from JSPS, Japan Society of Promotion of Science. It's not big money. Anyway, that's okay. And then, so we actually went to Japan in November 2011, so I got used to those people at the University of Tokyo.

And then there is some kind of Christmas party type of stuff in December, and my colleague, my host, he told me that there is an opportunity to go to Fukishima. Okay, Fukishima is the one, we could not do a survey because immediately after all of the people are forced to evacuate. And he said he is going to try to make an arrangement in Fukishima with the Fukishima Prefecture people, and it's going to be January, I guess. I said I'd love to go. He told me there is age limitations, which they're not bringing younger people because we do not know what the radiation is, so the lowest end of the age limit was his age. [Laughs] I think he is about 55 or 56, I suppose. And my other colleague—he is probably one year older than I am.

So, let's see. We went there. We went there in January, I believe. It was a restricted zone. People cannot get in. You have to wear those white clothes, and throw them away. And we might have to withstand radiation, so that—but not so much. You know, it's almost one year after. All of the human beings have evacuated. And at the very beginning, I thought it was

very difficult to go everywhere, because there was debris everywhere. I was wrong. All of the roads—I should go back. Most of the roads are cleared. And Japanese Self Defense Force, police also, are arranging to clear, to look for the bodies [1:40:00], in spite of the dangers from the radiation. I was impressed, in some sense. It was not really reported, such kind of stuff. But some of the part is clear, of course most part has such debris, and broken houses and everything else is just remaining like that.

And, let's see. So a few interesting things I saw as an engineer involved in tsunamis. One of them was the marks. We tried to go in, we tried to get back in. We always felt you have to go there in two weeks, in three weeks, otherwise those marks are going to disappear. I was wrong. After almost one year, there was a clear mud mark on the railings. It doesn't disappear because of the human beings; if it's just left alone, it's there. It's amazing. So that's one thing. Also, I saw lots of bridge—destruction of the bridges, and destruction of the sea walls, coastal dikes. Also I saw that in the northern part also, but Fukushima is a different story.

The most interesting part is, yeah, one of the locations is quite intriguing. You know, Japan is such a diverse place, a very cultivated place. So even though you have a small valley, coastal valley, they tried to make drainage, make farmland. And it's very rich farmland. And after the tsunami, small success, so-so, then it's going back to marsh. Now, if you look at an old map—old map means, I'm talking 200 years, 300-year-old map—it was a marsh.

CP: Hm.

HY: So going back to the marsh, so going back to the original state, and I saw lots of water birds who are really enjoying without human beings. And also some cows, calf; calf must be born after the event, I think. They are not tied. If it's tied, they are dead.

CP: Mm-hm.

HY: And I told my colleague about this: this is a real opportunity to see some ecological change and biological change without human beings. I think this is a real good opportunity, but it never happened in Japan. The next time I visited in Fukushima, same place—I went actually three times—that place is draining. There's new pumps. I just don't understand why they pump there, because that place will never become farmland. Right?

CP: Yeah.

HY: Because it's—well, we'll see. Probably not, that place is contaminated. Farmland is almost impossible in that place. But they have drained it. They really need to restore the previous state. I think it's a political reason.

CP: Yeah.

HY: It's a political reason to do this. This is, so much interesting stuff is happening there, too. But the first time I went to the site of the Fukushima area, there's lots of interesting stuff is happening there. Like, some of the building is large, very large in depth. It's a gym; it's a very large school gym, I believe. It's about, I don't know, five meters height on that outside, but inside it's still not totally inundated. The wooden floor has collapsed; those kinds of stuff you don't see. When we passed by Fukushima Daiichi, there is a pile there; a ton of stuff of the tsunami is there. I was going to take pictures, right? But I'm glad I didn't, because the meter goes up like crazy. If I open the window, I guess they get really mad. [Laughs] And I had sampled some sediments without telling them anything, so we can actually measure those radiation, stuff in the sediments. I don't know the results, because I left it in Tokyo University. [1:45:01]

After that I went back there, as I said, twice. Fukushima is really something. Why people has to evacuate? I mean, this is ridiculous, in some sense. It's a total disaster, that place. I think I can do something, but it's very difficult.

CP: I want to ask you a little about OSU, to sort of conclude here a little bit.

HY: Yeah.

CP: You came here in 2002. Why did you decide—or maybe 2003. Why did you decide to come to OSU from Washington?

HY: Oh, I was recruited in some sense. Because OSU is around—you got the money from a group called NEES, Network for Earthquake Engineering Simulations, and I guess more than $4 million that we got from NSF. And note that it's 2003; it's not 2004, so there is not so many tsunami people. So that's why I was recruited, because it's a tsunami base, and they got the money for a tsunami base, and there was not a person who was working on tsunamis. There are good coastal engineers in Oregon State University, but I don't think there is anybody who come to the Tsunami Symposium or the Tsunami Survey, you see.

So that's why I was recruited here. I came here from the University of Washington to here. It's quite a bit different. I have no regrets. This is a really wonderful environment. Seattle is—personally speaking, Seattle is not the place for me. I do not know the reason. I think I had a real culture shock, not like I had—I didn't get any culture shock from Tokyo to Pullman. I got the culture shock from San Francisco to Seattle.

CP: Hm.

HY: In some sense. I don't know. But yeah, at that time they have Washingtonians and Californians. [Laughs] I don't know. Oregon is not that place, actually, but at that time, 1980s, 1980s is the Washingtonians. That's okay too, but different cultures. But anyway, besides that, I could not stand the commute in Washington. The size of the school is so big. And there is a good part in Washington, because of the big size, so if you look carefully there is a few good people. I shouldn't say good—a few people with whom can along. And I found a few good ones in Oceanography Department, Medical Engineering Department, the Aeronatics, Astro, Nautical Engineering area. They also have some good people in applied math. I was a professor in applied math, too, so I was quite comfortable there, in some sense.

But this was a real opportunity. I'd have a big wave tank and I can do some sort of tsunami research here. Indeed, I did tsunami research, although I could not get to use the tank so much, because of probably my own failure to get the money for this. But I got involved on this, giving some suggestions in the last ten years, and for that I think I had a... Okay, the lifestyle here is much, much better. You know that. Let's see. You have nice mountains. I'm not an outgoing person, and also I found good people in here also. There are excellent people in OSU. OSU is something like a spike, there is a big spike like this, and I have a few people in Computer Science, and Applied Math. Actually, there is no Applied Mathematics Department. [1:49:59] I got involved with some kinds of Physics people. And so, it's nice, in some sense. The only thing I'm missing here: there is no gallery. There is no art museum!

CP: Mm-hm.

HY: And also, there is no faculty club.

CP: [Laughs]

HY: I think those two ought to be here. I mean, faculty club is one thing. I mean, I had one at Washington, and so does everywhere. Stanford has one; Caltech has one. All of the places have good food and good atmosphere, good area. And that's the place we can get to know each other, the math people. And we started to do that in Engineering and Business the last two—I guess three or four years. I guess Dean Ron Adams started things. Every month they get together in one of the restaurants, and then they track—I guess Dean Adams' point was we try to make collaborative research. I guess that's what he wanted.

I didn't think that way. I went there just to get along with other people. [Laughs] That's it, but still it's a nice opportunity, just very small, Engineering and Business. But I think a faculty club is a really nice thing to have. It's very difficult, though, faculty club, because people don't see so much value, although there is a huge value in that area. It's probably, a faculty club is—I've got to shut my mouth. [Laughs] Not gonna say it.

CP: Tell me about the Hinsdale Facility, and the importance of that facility for you.

HY: Okay, well it's very important now, because my lab is moving to Hinsdale within a few months. I have my own small tank, and this is sort of real mechanics-oriented research. I've been working on this with mathematicians in another OSU, Ohio State University. And somehow, I don't know, where did that—? Let's see. Just go back, okay. You know, my advisor, PhD advisor, is Professor Hammack. He is a mechanics-oriented person who moved from Florida to Penn State, and he married an applied mathematician, Dianne Anderson. She is an applied mathematician in Penn State University,

and she does experiments as well. Because of her and Professor Hammack, those two people are very connected to applied mathematicians.

And I get involved from those activities before, and then after that. But it's not really material, as I never write the paper with them, but sometimes they invite me to give a talk, and they have some kind of field institute, a symposium in Canada, University of Toronto, and I get involved in such kind of stuff. And then somehow from that loop, they sort of connected me to this guy at Ohio State. And we got serious about research, and he has his own theory, mathematical theory, for the KP Theory. And I got some laboratory experiments, and I found quite interesting stuff, interesting because —can I talk?

CP: Yeah.

HY: Okay. Because this is one thing which I was very excited in the last three or four years. Okay, when a wave comes to make tsunamis, here is a vertical wall, impinging like this, going down. Amplification is 2; one plus one is two. If waves are moving around the wall, amplification is none—one. It doesn't change. But if waves are moving in weak directions, the theory—let's see; the theory is a late-1970s theory saying amplification factor is 4. That's a big deal for the engineering. How are you going to set the safety factor? Two out of four is a big difference. But after this theory is done from the late 1970s, nobody can validate, or I should say verify, those theories with laboratory experiments, no numerical experiments. [1:55:01] So, I did laboratory experiments more carefully, in the precise laboratory apparatus. And he did some analysis for the higher order, and it's more accurate. That makes a big difference. And then we found that four theory, in the four-fold amplification, is correct, but it's not going [unclear] for the real world. In the real world, it's about three.

CP: Hm.

HY: And I did make a laboratory experiment. He wrote the theory, and we try to write the last paper right now. We continue to do that kind of stuff. But that small wave tank, you know, if you think about this, it's sort of an amplification factor of four, and two, and one. It's not like the ah-ooh-splash-up [?] kind of stuff, right? Now this laboratory facility is now moving to Hinsdale within a few months. This time it was made with the support of the NSF, and the way I wrote the proposal, I made a big excuse. This is the one scaled down replica of the Hinsdale Large Wave Basin, and I made some kind of excuse saying that, you know, before you use those large-scale facilities, we can use a small one to do some kind of preliminary experiments. That's probably what we can do in the future.

Actually, I think we can use it for both cases. I'd still like to do those fundamental research. But at the same time, why not? We can do fundamental research for the large facility too, right? Both ways. So, it's going to be in Hinsdale side by side, Large Wave Basin here, my basin here, right next to each other. And I think this is really unique. I'll tell you what. The Hinsdale Tsunami Basin is one-of-a-kind in the world, because that was designed for tsunami research. We made some kind of improvement. We have a detachable beach that's very unique to that size. And then, the stroke of the wave paddle is very large. But as I said, you cannot make real tsunamis, but you have to be very careful; there are some limitations. Under my tank has made out of, everything is glass, even the bottom. So you can see through. You can measure optical instruments, measure with optical instruments. That's what you can do, and very precise. And it's a controlled environment, so you can do side-by-side different sizes, and I think it's going to be fun. And this, my tank is also one-of-a-kind, you know, in the world. It's lots of cred. So that this will be a very, very unique facility.

And I hope those, too, who contribute continue to give some sort of a discovery, and try to make a high-end research, try to raise the reputation of Oregon State, academic reputation of Oregon State University in the future, before I retire, I hope. [Laughs] And I think that's very important. That's what I think. Another important part of this is, of course, more directly related to the engineering research. After 2004 and 2011, there are lots of things to do, especially for the local effects, how a tsunami, or storm surge even, hurricane effects—how those hurricanes' surge, storm surge, and tsunamis are affecting the coastal infrastructure and buildings. New York was thinking about trying to make coastal dikes after Ike and Sandy. Is this wise stuff? I do not know. Another topic I can think of there is we really need to learn lessons, successful or failure lessons, from Japan and also Netherlands. Those two countries are the ones who made lots of stuff in the coastal lines. We're the one who haven't.

CP: Hm.

HY: We should learn lessons from this. And on top of that [2:00:00], if we ever elect to make such kind of coastal structures? For the engineering we're always making some sort of design criteria to make those structures. We should never forget to at least analyze what will happen if the hazard or outside forcing is greater than the design levels. Just making that analysis is important. So those kinds of stuff can be done, for the Hinsdale Facility can compute such a huge part of that, but not all of those can contribute to this. In the last ten years we had a NEES, and I wanted to get involved more, but I didn't. But I think we're going to try to do at least five more years. We are writing some sort of a proposal for the NSF for an extension of five years.

And then I think if it comes from this, I think we can do some more like academic—that's my personal sense, in any case—more academic-related research by the people in OSU. Because the last ten years, most of the use is done by the outside people, the shared uses. But I think we should do more on that. For that, if I have an opportunity I would want to use that, but more or less those academic-related research, it's sometimes very difficult to convince the people that it's important. I mean, as I say, on a professional factor of 1, 2 and 4, if you look back it's very important. But it's not like a—maybe it's too simple for other people. It's very difficult to convince. So I am hoping that OSU has such a function, to support those kind of old fashioned academic work as well.

CP: Well Dr. Yeh, thank you very much for this.

[2:02:28]