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ORAL HISTORY PROGRAM

Peter Liaw: Success in Academia Through Devotion and Dedication

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PREFACE

The following oral history is the result of a recorded interview with Peter Liaw conducted by Michael Gao on February 23rd, 2020. This interview is part of the AIME Oral History Program.

ABSTRACT

A teacher at heart, Peter Liaw is a proud mentor and professor of materials science and engineering to the next generation of engineers and states, “We are here to help students and make sure they can be successful or do much better than what we have.” Liaw’s passion for research and teaching has been influenced by his grandfather, professors at the National Tsing Hua University in Taiwan and Northwestern University, and his colleagues at Westinghouse. Emphasizing the importance of being grateful for those who helped him in his studies and career, Liaw addresses this as a key attribute, among devotion and dedication, to being successful. Liaw has made some of the earliest technical contributions to industry on the non-destructive evaluation of metal matrix composites and continues with research on fatigue behavior of materials. After working 13 years in industry at Westinghouse, Liaw transitioned to academia at the University of Tennessee and is now an Ivan Racheff Chair of Excellence.

Readers are asked to bear in mind that they are reading a transcript of the spoken word, rather than written prose. The following transcript has been reviewed, edited, and approved by the narrator.

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01:10 From Physics in Taiwan to Materials Science and Engineering at Northwestern

Gao:

Today is Sunday, February 23rd, 2020. This is an interview with Dr. Peter Liaw, who is a professor and Ivan Racheff Chair of Excellence at The University of Tennessee, Knoxville. The interviewer is Michael Gao. This interview is being conducted as a part of the American Institute of Mining, Metallurgical, and Petroleum Engineers' oral history program. We are sitting in the Marriott Marquis in San Diego during TMS' Annual Conference and are going to discuss his experiences in materials science and his contribution to the field. So now, let's get started with questions about childhood, schooling, and your job in engineering. Could you please tell me about where you grew up and your family?

Liaw:

Thank you, Dr. Gao. It's a pleasure to be here. I was born in Chiayi, Taiwan. That's in the Southern part of Taiwan. I went to Chiayi middle and high school. After that, I went to National Tsing Hua University in Taiwan. I studied physics.

Then after that, I went to military service for two years. I was a second lieutenant in charge of five tanks. So, I was getting training there because it's tough, but we went through it. After that, I went to Northwestern University Materials Science and Engineering to study certain material-related topics. My advisor was Professor Morris E. Fine. I worked on my PhD related to fatigue performance of aluminum alloys and high strength steels. I stayed there for about five years, and I work at Westinghouse Research and Development Center for thirteen years, from 1980 to 1993. Then after that, I joined the University of Tennessee as a faculty member.

Of course, I get quite a lot of help from my colleague of Oak Ridge National Laboratory, and certainly including Dr. Gao, who helps us on many, many calculations and, of course, advises quite a few PhD students. At Oakridge, I met many, many colleagues. In particular, Professor C.T. Liu really helped me quite a lot. Since I joined the department in Tennessee, Dr. Liu gave me a contract until he retired, working on inter-metallics, and, of course, he is quite famous in that area. We co-advise many PhD students and write many joint papers.

04:08 My Love for Teaching – How My Professors Influenced Me to Become a Professor

Gao:

Okay, good. The next question is who or what influenced you to become a professor?

Liaw:

That's a very good question. Actually, my grandfather wanted me to get into medical school, but I was too interested in physics. This is why I studied physics. Now, when I graduated from Tsing Hua University, I thought, if I continued my physics education, perhaps it could be somewhat difficult to find a job at that time. This is why I decided to study materials science and engineering. I happened to have a scholarship from Northwestern, so I went to Northwestern. Although, I'm grateful for the support from the University of Pennsylvania. They gave me a scholarship in physics and also University of Washington physics department.

Sometimes, I wondered, if I studied physics, what's going to happen to me? But, when I was at Northwestern, my professor, Morris E. Fine, was a wonderful person. He was a scholar and a gentleman, and I look at his career -- he was at Bell Lab for, I believe, nine years before he joined the faculty at Northwestern. So, I said, well, maybe I should do the same thing. So, that's why I went to Westinghouse. After that, I joined the University of Tennessee. Teaching is always my interest because I like to interact with young students and help them as much as I can. Also, I have more freedom with what I like to do, provided somebody can be successful getting money. As you know, it's so competitive. And, we are always writing proposals all the time. But, being a professor is always on my mind, especially [when] I saw what my professor had done in his career.

Gao:

Good. Thank you. Did any of your professors mentor you in any particular way?

Liaw:

Yeah. Certainly, as I mentioned, Professor Morris E. Fine influenced me quite a lot. Also, there were wonderful faculty members at Northwestern University, Professor Julia Weertman, Professor Hans Weertman, Professor JB Cohen, Professor Mesh, Professor Hedia, and Professor Schwartz. They are all very wonderful people, and they set an excellent example for all of us. Of course, they enjoy teaching. They enjoy interacting with many students, and that's set up a stage for me to become a professor, even though I was working in industry at Westinghouse.

Certainly, when I was at Tsing Hua University back in Taiwan, many of my colleagues there, top talents at that time in the country, because they were interested in studying physics. Many of them, probably 35 of them, came to the U.S. to get their PhDs, and we all talk. And, certainly, we all enjoy research. If we could, we'd certainly like to become a professor, besides the possibility of maybe working in industry.

07:51 The Influence of Classmates, a Missionary, and a Physics Teacher

Gao:

Okay. Thank you. Did you have any classmates that influenced your studies?

Liaw:

Oh, yes. Especially at the Tsing Hua University, we all worked together as a team, and we all talk and many of my classmates really help us. And, we discuss, to this day, we still communicate with my classmates back at Tsing Hua University. As a matter of fact, one of them Su Ching will come to the dinner Tuesday.

Also, at Northwestern University, many friends there. Some of them went to industry. Some of them went to academics. So we all interact, and they influenced me quite a lot.

Gao:

Okay, good. Did you have any influences such as religion or mentors?

Liaw:

When I was in high school, I went to meet an American missionary, Ms. Johnson, in my hometown for the purpose, at the time, to study English. But I also studied the Bible, and she also helped me quite a lot. I wonder what happened to her now? But, I always remember she told me that the reason she came to Taiwan was because she was sitting at the last pew in a big church, and her preacher says, "Does anyone want to go to Taiwan?" And, somehow, she stood up, walked from the last pew to the front desk, and then she sold all her property, put proceeds into the bank.

So, every month, the bank pays her some money. She stayed in Taiwan for many years, helping the many Taiwanese or Chinese there, and I came to know Christianity. There are many teachers [that] helped me at Tsing Hua University and certainly at Northwestern University. I still met my physics teacher, Dr. Curying Lin. He taught me maybe more than physics back in Taiwan, and I still see him. I saw him actually last year when I went back to Taiwan; he just retired. It's funny that I tried to be a matchmaker for his daughter.

10:44 Education is a Ticket Around the World – My Family's Encouragement and Childhood in Taiwan

Gao:

Could you tell us a little bit more about the early childhood of your family in Taiwan?

Liaw:

Thank you. I was born in Chiayi, Taiwan, a Southern part of Taiwan. I certainly had my father and my mother, and they are always very loving; also, my grandfather, especially, my grandfather. He was highly educated, and he always wanted me to become a medical doctor. But, I was too interested in physics, so I studied physics. They always encouraged us to get the highest education, as much as you can. So, I got their encouragement, and I continued to study. Especially to this day, even though my parents [and] my grandfather, of course, they've passed away. But, my mother always told me that, as long as you study very hard, you will have a chance to travel all over the place; and she is absolutely correct. So, we are all encouraged to study very hard and make the best out of what we have. Education is always the most important thing in our family. They will sacrifice everything for their family's education.

Gao:

Are you the only child in your family?

Liaw:

Well, good question. I have one brother and one sister. My brother is in Taiwan. My sister is in California. Actually, she's coming in tomorrow for dinner. They are all very lovely and very nice.

12:37 My Wife, Daughter and Son, and Being a Grandfather

Gao:

Okay, good. Thank you for sharing that with us. Would you mind telling us more about your family in America?

Liaw:

I have my wife, she's upstairs, and she came with me to the TMS Meeting. I have one son; he studied medicine, now he practices medicine. We are grateful that he's working in Knoxville, so staying with us. My son got married to Katie, and they have a son. So, I have a grandson who is about seven months old.

My daughter also studied medicine. She lives in California. I think it's because her husband is finishing up his medical school there. They have a daughter, and she is about one and a half years old. They are all lovely, wonderful kids. Being a grandfather is the best; you just play around with the kids, and you don't need to take care of them.

Gao:

Okay, that's good. Thank you for sharing your family information with us.

Liaw:

Thank you.

14:13 Working at Westinghouse with One of the Best Fracture Mechanics Groups in the World

Gao:

Now we're looking into entering into the profession, so some questions going forward. What are some of the biggest technical challenges that you experienced in your career?

Liaw:

Trying to finish up your PhD is always a big step, but my professor, Morris E. Fine, always helped us along the way. I did fatigue work, fatigue, crack propagation of aluminum alloys and steels. If I had difficulties, he always tried to help out. Because of his help, I know many people because he's a very famous person, and he also encouraged me to come do these AIME-type meetings. I have many friends, so if I have difficulty now, I can talk to my professor, my friends, and they are all so nice helping out. So, this is for my PhD study. Then, at Westinghouse, when you go to work for companies, it's different. Fortunately, I had very good colleagues there. It was one of the best fracture mechanics groups in the world at the time because Westinghouse was building nuclear reactor turbines. They needed lots of fracture mechanics background. So, they have one of the best in the world.

My colleagues, Professor John Lentez, Professor Norman Cardinato, they became professors. Dr. Steve Wutech, Professor Ashok Saxena, WG Crack, he was my boss at Westinghouse, he was my boss's boss. West and WG Crack, they helped me. I always remember when I went to Westinghouse, I tried to write

papers, and WG Crack always said, "Peter, let me share with you how to write papers." So, he took me aside and showed me how you should layout your paper, outline clearly and maybe add some figures, and start to write down what you're supposed to say. He always said something that, to this day, I'll always share with my group members, that writing is learning. You get to write to know something well. That's what I really learned from him. So, I'm grateful for my experience at Westinghouse. They helped me quite a lot, gave me lots of opportunities there. So, I can do work on fracture mechanics or fatigue and fracture mechanisms, publish a few papers, this way I can go back to academia to teach.

When I went to university, some things were totally different from industry. Going to academia is a big change, too; even though I was writing quite a lot of proposals at Westinghouse, but at university it's somewhat different. We had a tough time [with] layoffs at that time at the Westinghouse research and development center. So, some always say that if you can survive at Westinghouse, you can survive at any place. And, that could be true, because it's very tough.

At Westinghouse, every week, we had to fill out this 40 hours workload sheet. If you don't have money on your program, you're charged overhead. If you continue for one or two months, you probably will be gone. So, we were encouraged to write many proposals, and we got to know how to deal with customers, so they were happy with you. Then they could continue to give you money from our division or from outside Westinghouse in the Air Force or at the Electric Power Research Institute. So, it gave us lots of experience in terms of how to get money to research, how to sustain our programs. So, [I'm] in debt to Westinghouse for giving me this opportunity.

18:58 From Industry to University – Many, Many Proposals, Just Keep On Writing

Liaw:

As I mentioned, when I went to the University of Tennessee, it was certainly a totally different environment. But, I also had very good people helping me. As I mentioned, Professor C.T. Liu always helped me. When I arrived at the university, he gave me a contract already. Until he retired, up to about 15 or 16 years, always gave me a contract. Also, I remember Professor Carl McCaw, who was a director of our Center for Materials Research.

When I arrived at UT, I had nothing. So, he said, "Peter, I have a program for you. This is silicon carbide reinforced ceramics matrix composites." At the time, it was a very hot topic. "And, here is a student, Loren Mineala. You just take care of him, write papers, and all the money belongs to you, okay?" So, people really tried to help me so much. My colleague, Professor Ben Oliver, was an NSF director. I started writing my first NSF proposal, and I always remember he gave me his proposal, "Peter, why don't you take a look at this? This is a proposal I have." I learned from it. So, many people helped along in my career, so I appreciated the opportunities at universities. Of course, we are always writing many proposals. We failed many, many times, but the lesson I learned is that you should never give up, keep on writing.

In many cases that we would write, it took us three or four times to get money from NSF, National Science Foundation. My colleague Professor Yanfei Gao, we actually tried seven times before we got a program. So, it's tough, but I think, if you stick to it, continue, you will be successful. Maybe the program managers say, "I see this proposal too many times, perhaps I should give him or her some money to play around with; otherwise, you'll come back again."

21:16 Developing Life Prediction Technologies for High-Temperature Components with Ashok Saxena

Gao:

Professor Liaw, could you please share some of your technical contributions to the industry?

Liaw:

Thank you for the question. I don't know what kind of contributions I have in industry. However, I appreciate the opportunity that I work with my colleague, Professor Ashok Saxena, who is a top-notch, high-temperature fracture mechanics engineer. They told me he became a professor at Georgia Tech, as a professor and then department head. And, he went on to the University of Arkansas to become a provost there. So, we worked together at Westinghouse, and I learned quite a lot from him. We worked together; we had contracts from utility companies and from Electric Power Research Institute.

We focused on the life prediction of a high-temperature component. Just to give you one example, if the utility is operating steam pipes, and, if there's a rupture, for example, a steam pipe going through the restaurant and when it ruptures the steam coming out is at high temperature, high pressure. So, it's just like a Japanese sword; it cuts through the people.

It's a dangerous venture. If this happened, especially when someone gets hurt and the x-ray happens, then that utility, we say that the piping company is not doing a good job because we got defective pipe, and that's all your fault. A piping company we say that this is utility fault, you didn't follow the standard procedure to operate your piping system. So then, they get into a big lawsuit worth millions. And then, you shut off that piping system, maybe one that could cost $1 million, depends on the system you have, especially for nuclear reactors. So, it's important to predict the life of elevated temperature structure components. You have to inspect it; if you see a crack, you have to estimate how much longer before that rupture occurs, so that we can avoid all those kinds of accidents.

This is why fracture mechanics or high-temperature life prediction is very important. Professor Saxena and I worked on this topic, and we wrote several papers in this area. Professor Saxena also wrote the computer programs, and they were used often in the utility companies or even in the Electric Power Research Institute. So, that's one of the areas I think we really had fun working on when I was at Westinghouse.

24:20 Fatigue Behavior and Non-Destructive Evaluation of Metal Matrix Composites at Westinghouse

Liaw:

Then, myself, I also worked on fatigue and fracture behavior. There are many utilities that, the machine manufacturing, they need quite a lot of fatigue properties of structural components; so they always come to Westinghouse, or even at Tennessee, they call, and they want to know some of the databases or would ask: “Under what kind of condition, how is it fatigue? What kind of fatigue causes the final failure?” or “What kind of fatigue threshold variables do you have so we can use it to assess the integrity of structure components, such as nuclear reactors?”

So, that'll be the second topic, fatigue behavior of structured materials. The third topic would be non-destructive evaluation of metal matrix composites. So, at the time, my boss, WG Clark, he had a big

program or corporation, and we were looking at how to inspect the integrity of silicon carbide reinforced aluminum composites. We did one of the earliest works in this area, tried to assess the integrity of metal matrix composites using the non-destructive evaluation. Sometimes, the work is also quoted. I did not know that until some people actually told me about our work at Westinghouse concerning the non-destructive evaluation of composite materials. So it was three areas, high-temperature fracture mechanics, fatigue behavior, and then non-destructive evaluation of metal matrix composites.

Gao:

Excellent. Thank you for sharing that success story with us.

Liaw:

Thank you.

26:24 University and Society Awards, Importance of Basic Research, and Depth In Industry

Gao:

I'm sure you've got a lot of awards. Did you receive any awards in your career? If so, could you explain?

Liaw:

Yeah. I'm grateful for the opportunity I had at Westinghouse. I was a senior engineer, promoted to fellow engineer. Then, at the University of Tennessee, they gave me the Ivan Racheff Chair of Excellence and John Fisher Award, and John Fisher Professorship, and then the Distinguished Professorship. Also, I'm grateful for the opportunities from the TMS and ASM; I have TMS Fellow and ASM Fellow Awards. I also have an award for outstanding service from the structural division of the TMS organization.

Gao:

Oh, wonderful. Your work deserves all these awards. This conversation is pretty good. What milestones in industry do you think had the biggest impact to industry? Could you explain?

Liaw:

I sometimes feel not so comfortable for many big corporations. They will give up on basic research, and they should try to do it again because it gives a company some depth. Now, if you only focus on day to day type of business, and then you don't have a long-term plan. Of course, we understand the stock market; you have to do it nicely; otherwise, that corporation is not too good. But, I wish that the big bosses in the corporation would also pay attention to basic research because that really gives you some depth. Then you have a chance to change to different areas. Otherwise, we are too shallow; we cannot be competitive. So, it's important to focus on day-to-day type research; also, it's important to consider basic research. That's what happened to Bayer Lab. There were so many Nobel Prize winners, and also the company was doing very well back in the old times. It'd be nice to see the company coming back and focus on basic research rather than just making quick money.

Gao:

Wonderful. Thank you.

Liaw:

Thank you.

29:13 The Challenge of Academia – Writing Competitive Funding Proposals and Never Giving Up

Gao:

You have been a professor for almost 27 years. So, in your opinion, what are the major challenges to be successful in academia? What advice could you possibly offer to young scholars, graduate students, and postdoc research associates?

Liaw:

Yeah, that's an excellent question. Certainly, being a faculty member is tough. You have to teach; you have to do service. You have to somehow get your research going. It's very competitive, especially getting the funding. I would think, if you continue, never give up, then you have a chance. For example, I just mentioned to you that Professor Yanfei Gao, my colleague, he and I wrote a proposal seven times before we got our program actually funded, one year ago. Another example is that we try to develop this NSF Integrated Graduate Education Research Training Program. It's a sizable program. My dear colleague, Professor Ray Buchanan, he was a scholar and gentlemen; of course, now he's in heaven. So, he and I, we worked on this IGERT proposal. It took us three times. Even my wife mentioned to me, "Well, maybe at Tennessee, you have no chance." So, we continued to try, and the third time is a charm. So, we got it—this IGERT program. We support many American students. They are all doing quite well because the program is geared for American or permanent resident students.

Then another story is that we tried to get that MRI program, Major Research Instrumentation Program of NSF, at the time, the highest amount of money, $2 million. Of course, now they expanded the program, and it's much higher than what we had at that time. It was very difficult because you had to go through the materials division. Then you compete with a second level from physics, from chemistry, from engineering division and go to the third level. So, it's very difficult to get this kind of sizable program for the Major Research Instrumentation Program. So, we also tried three times, and we worked with Professor Hahn Choo, my colleague, Professor Zhiquan Wang, Professor Ken Harper. And, at the time, we failed twice.

So, my colleague told me that "Peter, you are asking too much. The 2 million dollars, we should cut down to 500K." Only at the time, maybe some of you still remember Dr. Tom Mason, he was director of the SNS, the 1.4 billion dollars Spallation Neutron Source, only he and I decided we should continue. So, we tried a third time where we got the money to build up the volcanism. Dr. Gao, you're going to Spallation Neutron Source, so during the visit, you will see the instrument. So, it was difficult, but the key, I can say, is never to give up. The reason for this is I have some friends come to visit us; they're Nobel Prize winners in their department. So, I'm certainly curious.

I asked him, "How about the Nobel Prize winner? Is it easier for them to get money?" He told me that it's difficult, even for the Nobel Prize winner. Many of my colleagues are NAE members, the National Academy of Engineering, or the National Academy of Science; it's also difficult for them to get money. So, the key, I understand is that you just have to continue, never give up. Some of my colleagues are very distinguished, but they never give up. Some of them tell me that, "Peter, I had 12 proposals last year; maybe I get one or zero." But, I know he is going to continue to write proposals and become very successful.

But, if you don't continue, and it's tough, especially in the US. That is a totally different system; as Dr. Gao knows in China, one who gets a Nobel Prize or if you become NAE member, [you get] equipment, your life is set. They simply give you money. They see your status; they give you money. But, the US is different; everything is so competitive. You can see, we go to NSF, give your proposal some time. If a proposal is written by a Nobel Prize winner, if the proposal is not well-written, it won't get funded. Even though people recognize this person got a Nobel Prize or is in NAE or NAS, we still have to write excellent proposals. Everything is on a fair competition, and we just have to better prepare ourselves and be persistent, continue toward what you would like to do, and you will be successful. Even though we have lots of frustrations, never give up, persist, you will be successful -- for the younger generations.

Gao:

Thank you very much.

Liaw:

Thank you.

34:51 Attending Society Meetings Since Northwestern – An Opportunity to Present and Network

Gao:

Now I'm going to switch to questions about society membership. The first one is, when did you first hear about AIME and/or your membership society? How did your involvement progress over the years?

Liaw:

Well, excellent questions. I became a member of ASM and TMS when I was in graduate school. My advisor, Morris E. Fine, was always very supportive of this kind of society meetings. So, he always sent us to meetings. Since I went to Northwestern, I've always gone to TMS and those ASM meetings every year. I continued that way, even when I was at Westinghouse. I think back about my career; I think that society really, TMS and ASM, helped me quite a lot. It gave me an opportunity to present my work and also gave us a chance to organize a symposium, as Dr. Gao has organized many symposiums. It gets a lot of networking going on in societies. Sometimes I need lots of help. Sometimes other people need help. So, we work together, make the society better.

So, I strongly suggest we should encourage our team members to come here to give a presentation. For example, this time, we have five team members from our group coming to TMS meetings, and they all will give a presentation on posters. This is important because I went through the same thing, even though it's difficult to support students to come because funding is so difficult to get. But, we all try our

best to support the students to come to a TMS meeting. I even tried to encourage some of my colleagues at Tennessee in mechanical engineering or even in mathematics. This year, there are several of them from mechanical engineering and from physics who come to TMS' meeting to present their work related to high-entropy alloys, which Dr. Gao is an expert in.

37:08 Tremendous Benefit of TMS Meetings On Career Development – "I Just Cannot Live Without It"

Gao:

Thank you. So, the second question is, how has membership benefited you in your career, and how do you see societies benefiting people in the industry today?

Liaw:

I would say it benefits tremendously. Without TMS, I don't know what I'm going to do. They gave me opportunities to present papers, organize symposiums, encourage my students or even postdocs to come here to attend a meeting. They offer lots of opportunities. For example, Chongo is looking for his job. As Dr. Gao knows, we co-advised Chongo, and I encourage them to come here to give presentations because I want to see our team members successful. If the team members are successful, then our group gets a good reputation. This applies to my colleagues' group, too. So, the TMS meeting is always very helpful to my career development, and I just cannot live without it. I've come to almost every TMS meeting since I was in graduate school.

It's also helpful for the people from industry because I was at Westinghouse for 13 years. I believe [I would] go to almost every TMS meeting or ASM meeting, many times go to ASTM, American Society for Testing Materials. So, they strongly encouraged people to be involved with society meetings. You have so many network-type opportunities. Also, you can verify if your work is good or bad because you get critiqued by people and get lots of interaction with other people. So it's a very good thing to come to society meetings, especially AIME type of meetings; that is my main society membership. So this is wonderful to have this society going.

Gao:

Thank you. If you were to recommend your membership society to a new graduate student, what would you tell him or her about it?

Liaw:

I would say, if you want to be successful in your career, it is essential to have this kind of membership. I'm teaching undergraduate courses on mechanical behavior of materials, and I think four or five of our undergraduate students come into the meeting. Before they came, I told them that it's important to come here, also enter into competitions, and then try to give presentations. Some of them also could give presentations. We always have rehearsal in our group meeting; everyone's welcome to come. I strongly support students coming to TMS meetings, if my budget allows it.

40:31 Attracting Students to Industry – Increasing Industry at Society Meetings

Gao:

In your opinion, what do we do to attract young people to the society, to the industry?

Liaw:

I think it's probably good, like a TMS meeting or ASM meeting; it's good to have some more industry to come. We do have some. Of course, people may tend to say that for TMS, they tend to have more academics, but I think TMS also continues to try their best to encourage more people from industry. When people come, like Chongo is graduating, and you can see how good he is, and try to offer him a job, even though he's more interested in academic-type positions. I always remember I have a very outstanding student, Ian Zhang. Now she is teaching at Tennessee Tech, and she is a director of their manufacturing center. She gave a beautiful TMS talk; I always remember that. She speaks very good English, and after her talk, it was on coatings, at a big conference, and many people came around her, asked her many, many questions. Eventually, she got this one offer from industry.

So, it's good to have more people from industry to attend TMS. It is really nice with TMS to continue pursuing this area besides the involvement from academia. That will be very good to attract a student to go to industry and also the industry people can find the people they need from the society.

42:20 Mentoring the Next Generation – A Pleasure To See My Students Improve the Field's Research

Gao:

Good. Wonderful. So, we're going to the last phase of a question. So, the first one is, what has made working in the field meaningful to you, or what has been your favorite part of working in the field?

Liaw:

It's always a pleasure for me to work in some area I'm interested in. As I asked my professor, "What would you like to do if you had the chance again?" He said, "Peter, I want to study materials science. I've seen enough phenomenal situations, but I may, if I have a chance again, make it my MD-PhD." I started studying materials, and it's just nice to, especially from an educational point of view, you see a student coming in, they don't know too much. After four or five years, as Dr. Gao knows, we are co-advising many students, they write quite well, and they publish many papers.

Dr. Gao knows, we had a student, Ray Fong, and he went through a very competitive competition that Oakridge special positions at the Spallation Neutron Source. They had probably 40, 50, or 60 people apply for this position. It's a position you don't need to tie with any beamline. You basically go in there and focus on science. So it's a very ideal situation, especially for someone who wants to go to teach. Of course, it's very competitive. So they eventually, out of 40, 50, 60 people, they invite about four people; and two of them from our group, Chongo and Ray. Eventually, Ray got the position, and you see your student find a top-notch job, and you're very happy about that. I'm sure they will continue to be successful. So, I've been in academia, in the research area, you see your student graduate, and they publish many good papers, win a good position. I'm sure Dr. Gao may have a similar kind of feeling that we are satisfied.

Then doing research, I enjoy encouraging students to write papers because, as I learned from Westinghouse, writing is learning. I always try to encourage our team members to write papers and publish high-quality papers, so they could have a better chance to find a better job. We do see many students going in this direction, so I feel happy about that. Dr. Gao and I, we co-advise currently, or previously, Ray Fong and also Chongo, who are very outstanding students. And, I'm sure Dr. Gao feels good that they'll do quite well and send their papers to very good journals. It's just a pleasure to see them become mature. We continue to hope and pray they do well in the future. Doing research is interesting. Also, it's a pleasure to see the younger generation; they become better.

For example, I didn't get a job at GE Schnectady Corporate Research and Development Center. That's a top-notch place, and I'm happy to see two of our team members working there. Yuan Chang and Shannon Huang. They can do better than what I had before. So, it's a pleasure to see our next generation do much better than we can do because we are here to help students and make sure they can be successful or do much better than what we have.

Gao:

Yeah, indeed. You have been doing an excellent job in training a lot of top-quality students.

Liaw:

Thank you. Well you help out quite a lot. We appreciate that.

Gao:

Also, what advice would you have for today's young leaders in the engineering profession? Do you have any advice for today's young leaders in the professions?

Liaw:

I think it's good to continue attending the society meetings and making contributions, [but it] depends on what kind of position you are in. It's nice to always do something new and unique and help other people, friends, and certainly you, yourself, also need help, too, and continue to work together. So, we have lots of active networking and help each other so the society can become better. Overall, we like to do high-quality work, it's important. All those young leaders can become very successful. If you publish high-quality papers, your name will be known, your impact in the field, and people recognize you.

Gao:

Wonderful. Thank you.

Liaw:

Thank you.

47:25 To Be Successful We Must Be Grateful People and Persistent, Dedicated, Devoted In All We Do

Gao:

Professor Liaw, thank you very much for sharing lots of your personal experiences with us.

Liaw:

Thank you.

Gao:

So, the additional question is, do you have additional advice for younger generations, even graduate students, to shape their careers?

Liaw:

Yeah. That's a very good question. Maybe we can expand it to graduate students and postdocs, or even the younger professionals. Besides what I talked about, that we've got to be persistent in whatever we are doing, especially in the academic setting or even industry, too. I mean, many times we have to write proposals, you've got to be persistent. Besides that, I think to be successful; it's important to have a grateful mind. You have to remember people help you, and always keep this in mind, rather than people help you, and you never remember that. Whatever you want, we have to be a very grateful people.

Also, it's important to be dedicated and devoted. If you are not dedicated and devoted, you just cannot be competitive. This certainly is a very excellent society; also it's very competitive. So, if you want to succeed in a particular area, you've got to be totally devoted and dedicated. There's no other way I can see. On the other hand, if someone is very dedicated and very devoted, as we see many successful people, then you will be successful because it's a wonderful society. It gives us lots of opportunities, but it also demands us to have total dedication and total devotion to be successful.

Also, as I mentioned, be persistent, be grateful for what we have. Be grateful that we remember who helped us so that we can be successful. If you are not grateful and always just take advantage of other people, then people may not like to work with you anymore. So, it's ever so critical to be grateful.

49:47 The Importance of Balancing Work and Family

Gao:

Thank you. So do you mind me asking a personal question?

Liaw:

Yes, of course.

Gao:

My observation is that you are working so hard; I was thinking, as a professor, you now even don't sleep. So, how did you make it to balance your life, and then work, and profession? I mean, your wife never complains? Your kids never complain? Do you ever spend time with your family? Are they happy with your dedication to work, work, and work?

Liaw:

Yeah, that's a very good question, from someone with a balance in life and work. I think it's important to pay attention to both of them, so you won't have regrets. I try my best to see how can I benefit and do well on both sides; as Dr. Gao mentioned, that certainly I work pretty hard. But, I also try to, hoping my wife will be happy, my kids will be happy, because I may not be 100%, but I try my best. Especially when it comes to my granddaughter or grandson, I think I should pay more attention to them. Yeah, but I think it's important to have balance.

Gao:

Okay. Thank you very much.

Liaw:

Thank you.

51:13 Combining Experiments and Theory to do High-quality Research and Be Successful

Gao:

Is there anything else you would like to discuss?

Liaw:

That's also a very good question. Throughout my life, I have had so many friends help me out: team members, students. I learned quite a lot from those students and many of my friends in tech together, including Dr. Michael Gao. It's just a pleasure to work together so we can understand that some particular topic well, especially now; Dr. Gao and I we are interested in high-entropy alloys. He has a theoretical background, and I'm more experimental in nature. It's nice to let our team members know that in order to do good work, you've got to use both theory and experiments, and certainly, we cannot do everything. Sometimes we need help. I can see already Dr. Gao is a super-duper theoretician on high-entropy alloys, and he helps so much.

So, we assure that our younger generation, they know both we had to combine experiment and theory to do high-quality research. I hope the younger generation can carry on. Of course, this is only from an academic viewpoint, but even for industry, it's important to also focus on experiment and theory. Also, give out advice to our undergraduate students because, when you work in industry, you tell your boss, "I think you should increase the strengths." It's much better to say, "We should increase by 20% or 30% of the quantitative value there." So it's always important to include both theory and experiments together to be successful.

Gao:

Okay, wonderful. So, in conclusion, what a fascinating career and a life you have had. What a pleasure it has been to spend this time with you. Thank you so much again for your willingness to share your story with AIME. Thank you very much.

Liaw:

Thank you very much for this opportunity, Michele and Dr. Michael Gao. It's a pleasure for me to be here. Hopefully, what we discussed will be helpful for the younger generation. We see a much more successful, younger generation, especially now, and we can carry on generation by generation. Thank you.