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About Ulrich L. Rohde

Ulrich Lothar Albert Rohde was born in 1940 in Munich. Rohde attended universities of Munich and Darmstadt, studying electrical engineering and radio communications, and received a PhD in electrical engineering (1978), an Sc.D. (hon., 1979) in radio communications, Dr.-Ing. Degree from the University in Berlin (2004), and Dr.-Ing. habil. degree from the University of Cottbus (2011). He is Chairman of Synergy Microwave Corp., and President of Communications Consulting Corp.

In this interview, Rohde discusses his childhood, early schooling, his doctoral work with low noise oscillators, his career at RCA, Synergy Microwave Corporation, and IEEE. Attached at the end of the interview is a photo gallery and supplemental file of written responses to general questions.

About the Interview

ULRICH ROHDE: An Interview Conducted by Michael Geselowitz for the IEEE History Center, 7 July 2020.

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Interview

INTERVIEWEE: Ulrich L. Rohde.

INTERVIEWER: Michael Geselowitz

DATE: 7 July 2020

PLACE: Virtual

Introduction, childhood, education

Geselowitz:

This is Michael Geselowitz from the IEEE History Center, and I'm interviewing Dr. Ulrich L. Rohde. This is actually a remote interview. I am at my home in New York City. And Dr. Rohde is in his office in northern New Jersey. I want to say Passaic? No.

Rohde:

It's Paterson, Paterson.

Geselowitz:

Paterson, New Jersey, in the office of his company. So, Ulrich, we like to start these interviews, can you tell us a little bit about your family background and your childhood and your education and how you became interested in technical things.

Rohde:

Well I was born in 1940. I think that's not a big secret. And I had two grandfathers who were chemists. One was famous because he invented the Fischer-Tropsch method, liquidation of coal into gasoline. The other was less noisy, so to speak. And my father studied physics but then moved into electrical engineering. The first years if my life and its adventures took place in Munich. At the time from 1940 to '45, in World War II, it was not real easy. At times in the basement, sitting with a steel helmet, you really didn't know whether you would survive or not. It was frightening. And I remember I didn't really know what dying meant, but I knew it wasn't good. But I survived the war. And then I went to the typical schools for Germans, but ultimately, I found myself in a special school for people who do like scientific topics. And this was of particular interest for me, as I met there somebody who built a remote-control transmitter for radios for airplanes. I remember the entire circuit. We actually used a pentode for audio amplifiers to build this transmitter working at 27 MHz. During this entire period, I really was fascinated by technology. And my father did one other dangerous thing. He gave me a book with the translated title, “How Does This Work?” And I think I was most fascinated with the ski jump, where you pick up speed and then ultimately you go off the plane and then you jump furthest with little control, at least that’s how I felt it was. Then you just touch the plane again, and whoever gets furthest away, wins. But the physics and mathematics behind this, how to calculate this was really fascinating. And it took a while before I understood the mechanism and the physics and the mathematics behind this. I think this started my interest in engineering things.

Geselowitz:

So, was there a family expectation? Is that why your father gave you such books, because all your family was scientists on both sides?

Rohde:

I think at times I was bored at the school because I needed to expand my horizon, and this book with the title “How Does It Work” really opened a lot of things. As I said the ski jump was the one that I remembered the most. I'm sure there are other useful things, but I just don't remember.

Geselowitz:

And then where did you go to university?

Rohde:

Yes, I went first to the university in Munich. In Germany you have to pass a somewhat more difficult qualifying examination than getting the high school diploma in the US. Then I went to the Technical University of Munich. And Munich being a very nice city with all the mountains and lakes and everything, having too many distractions I found myself torn between work, starting and not starting to study. But for some of the seminars there was a waiting list so I decided to go to the Technical University of Darmstadt. And Darmstadt was much smaller and things were less distracting, and an extraordinary good scientist, Prof. Küpfmüller, was one of the famous scientists who taught there.

Geselowitz:

And what course of study did you pursue?

Rohde:

Well at the time it was really both communication theory and electronics/RF circuits together. Today microwave circuit design and communications theory are separated. And I made the somewhat stupid mistake of being too early interested in semiconductors/transistors and how to build microwave circuits with them. So, in 1965, I published a book on microwave transistors and circuit design. And this didn't help very much because practically all the professors said in a negative way “well you know all, if not better”. So, my life got very complicated at the university. My advice is don't write a book when you're a student. It doesn't help.

Geselowitz:

So, you published a book when you were still in university?

Rohde:

Yes, when I was 25 years old. It sold 10,000 copies. And the amount of money I made from this wasn't very much, bad contract. And as I said, the book did not help me very much at the university. I became famous as the student who wrote a book.

Doctoral studies, low noise oscillators

Geselowitz:

Interesting. So, what did you do your doctorate work on?

Rohde:

On low noise oscillators. And a lot of mathematics, in the non-linear time domain, how do you predict and calculate correctly the resulting phase noise of an oscillator, depending on Q, and other parameters like the semiconductor behavior and other parts which are parts of the circuit. This was at the University of Berlin. Going back to Darmstadt I met the best professor teams, one was in Munich, Meinke and Gundlach, and the others were Zinke and Brunswick in Darmstadt. Each team offered a good textbook. The Handbook of Electrical Engineering came from Munich, and the text book on Microwaves and RF as we call it came from Darmstadt.

During my time being in charge of the Radio Business Unit of RCA I met Professor H. Hartnagel at the David Sarnoff Laboratory who reconnected me with Darmstadt. His expertise still is in Terahertz. Also I was lucky to have met Arye Rosen at Sarnoff, later a professor at Drexel University.

And a few years ago, I ended up being asked by Professor Hartnagel and Springer to take the old, more or less now obsolete textbook and rewrite it with a team, this time in English.

Geselowitz:

And what were some of the applications of that at the time?

Rohde:

Well, the difficulty you have in any radio, is the dynamic range. And the dynamic range gets determined by the mixer's dynamic range and the phase noise of the local oscillators (Blocking effect). If the local oscillator is not good, the phase noise energy left and right of the carrier gives the adjacent channel problems. And therefore, the noise, or rather lack of noise is most important. How to reduce the sideband noise was the topic. And so, these two things I was most interested were those potentially causing problems. And I remember, as I worked for AEG-Telefunken in Ulm, I had a huge antenna on the roof of the house and I couldn't hear anything useful because the antenna was too effective and the receiver was overloaded (had too much pre-amplification). So, the Department of Defense loaned me a somewhat deaf receiver, no preamplifier. All of a sudden, I could hear the time signal from Canada in the 40 m band. Which I couldn't do before because the receiver was overloaded. But the concept of dynamic range as we know it today, both impacted by the mixer and the phase noise, was not known at the time.

Geselowitz:

So, while you were in, since you were pursuing a doctorate, were you thinking about an academic position? Or were thinking about an industrial position?

Rohde:

Well, I never wanted to be in academics. At the time all the things you have, was grading students and not always doing research. You're too focused on things that didn't end up in the product. And I do like a life where at the end of the day, you have something—you've made it, you build it, it works, everybody wants it, as kind of being productive. And so, yes, I ended up more or less in industry and not academics. But you need a very solid background in these electrical engineering topics to be useful.

Post doctoral work, Synergy Microwave Corporation

Geselowitz:

So, then what was your first position after you received your doctorate degree, and how did you obtain it?

Rohde:

Well, how you obtain it, you submit a dissertation and pass an oral examination called defense. That's a simplified answer. And at the time I did this, I already owned Synergy Microwave Corporation. And so, it helped us to build better oscillators and have a better product and understand better what we're doing. Because up until then, most of the linear mathematic treatment about oscillators were plain and simple wrong. Here's a simple example. The linear approach tells you; you have a feedback system. And if the feedback system compensates all the losses, you have several types of losses, then the figure of merit 'Q' is infinite, the bandwidth then is zero. So, how come then the oscillator still is noisy? So, the linear theory was always wrong, and I wondered why this happened. It turns out that the negative resistance that it produces is the culprit. To put all the things together was exciting, and so I'm very happy that these we now understand on how to build these very low noise oscillators.

Geselowitz:

Okay, and did you develop or invent anything else in that, in that position? Or just the oscillator work?

Rohde:

No, we also produce synthesizers. But my personal preference is a combination of many RF topics. And so, after I moved to America—to escape the statement, "are you the son of the famous father"? —I used to work for the RCA Corporation in Camden, which was a radio supplier for the National Security Agency. My team and I, I think, we built the first software-

defined radio where you have all the complicated tasks to solve, problems of dynamic range of mixer linearity and oscillator phase noise. And there's something else to solve like the Gibbs Phenomenon “ringing of the filter”. The software-defined radio was really designed from the loudspeaker towards the antenna. You look at a composite filter (look up table for the filter coefficients) from which you can design a very good performance which is not possible with discrete components, You can put the coefficients, a combination between a Gauss type filter, a Bessel type filter, a Cauer type filter, so you get a much better time response than with discrete parts. These are the type of things in mathematics and software and hardware (A/D converters) we did at RCA. And RCA ultimately was taken off the market, and General Electric took it back. At the time Compact Software was available, so I bought it. So, then I ended up more in mathematics and semiconductor physics to get the program going than in hardware.

RCA

Geselowitz:

So, let me just interrupt for a second. What year did you come to America and join RCA?

Rohde:

I came to America in 1973, to be in charge of the US R&S subsidiary, a sales company which I didn't do very well, I'm not a salesman, I learned the expression snake oil salesman. This was a new vocabulary I didn't know before. And then I had headaches with my father because he never delivered things on time and not always to datasheet performance. So, we had a falling out, and I ended up at RCA Camden a couple of years later. The RCA tenure lasted three years, and then RCA was taken off the market. And then I bought Compact Software, and it was a major effort to make it in to one of the leading Microwave/RF CAD companies. I think that's the two technical things I'm most proud of, that the team and I were able to develop what today is called the software-defined radio at RCA. And second, at Compact Software we solved the mathematical methods of calculating the time domain-based oscillator phase noise in a CAD tool. This capability didn't exist at the time. I worked with the Italian professor Vittorio Rizzoli, who generated the framework for the CAD tool and we did include the semiconductor noise contribution. And what I remember most from these days is, most competing CAD companies tried to use some mathematical shortcuts. I used to tell people, yes, if you use company X, you get faster to the wrong answer. And as we didn't take any shortcuts, yes, we were always a little slower, but always accurate. It was interesting to put all these capabilities together. It took about 15 years of my life to get a good and solid CAD tool with perfect solution, and it still is, thanks to the team effort, better than the most.

Geselowitz:

So, just a couple of quick clarifying questions. So, when you came to the US in '73, it was sort of a compromise. You were escaping from your father, but you were going to represent his company in America initially. So, it was only a partial escape, but then you had the falling out, and you did a full escape. Is that more or less…

Rohde:

You are technically correct because you could only get a work visa to go to America if you had a sponsoring company. You see what happens these days. Essentially nobody gets a work visa. Yes. I only got an intercompany transfer visa via R&S. That's how the system worked. And, yes, at the end I had a falling out with the company, not so much with my father. He owned half of it. But I mean the exchange rate of dollar to Deutsche Mark, now Euro, was so rapidly varying that ultimately the conversion calculations were always wrong.

Geselowitz:

So, another quick question. You said that you worked with Vittorio Rizzoli in Italy on this.

Rohde:

Yes.

Geselowitz:

So, how easy or hard was international collaboration in those days, in those ancient days?

Rohde:

Well this was kind of university work. My Italian was not great. I used to have a girlfriend when I was 17 years old, an Italian girlfriend. So, I remember all the wrong words in Italian. But it was interesting when the translator between Rizzoli and me and a broker tried to negotiate. I was fairly fluent in Italian, but my grammar is not very good. So, I understood when they talked to each other in Italian, they were trying to get more money from me. Listening to all these conversations was kind of fun... Rizzoli is an extraordinary, gifted, and very nice man. But he had his difficulties with the university, things he could do or couldn't do. So, we had to finance him and work with him via an Italian holding company, which sometimes was a little difficult. And yes, the framework and mathematics he developed—so-called harmonic balance method—was the key of all these modern tools. He's the father of the harmonic balance method and other work, a great man.

Compact Software

Geselowitz:

So, after that work, what was your next endeavor, either company-wise or project-wise?

Rohde:

Well, after I left RCA, buying the leftover of Compact Software I took possession of two big wagons of tables and computers. Most of the people who worked at Compact Software were on the West Coast and didn't want to stay with it because it was moved to New Jersey. And so, I had

to build a whole new team and do most everything myself in the beginning. It was really hard work. The culture in a software company was totally different to what I was used to. It's less disciplined but very innovative. It has its merits and drawbacks. At the end of the day, we had a wonderful product. And then after all I flunked two tests. First, I didn't have enough money to come up with a huge distribution organization, which is key for products. And the second thing I flunked was I couldn't find anybody who had a meshing generator to do a 3D simulation. Ansoft had the tools and so did MacNeal-Schwendler. At the time these discussions took place, those companies also negotiated technology transfer. Ultimately, I ended up merging Compact Software with Ansoft, and we had a really great time. Later I left the software business, and I've been concentrating on Synergy Microwave, which we also own, and on other scientific projects, books I published and related topics.

Geselowitz:

So, when did you start your current company?

Rohde:

Yes, Synergy Microwave was more or less started in parallel when I left RCA. And this has a most unusual history. At my days at RCA, I won a contract from the National Security Agency for a receiver. We selected a local New Jersey company, Engelmann Microwave who was supposed to build those receivers. Soon we had a few prototypes that worked, and then a suspicious fire occurred. Then a big bulldozer made the company very flat. There was nobody in there at night when it happened. A big fire, most of the documents and hardware were lost. But out of the “left over” we formed Synergy Microwave as we are known today.

Geselowitz:

Hmm. And what projects at Synergy are you most proud of?

Rohde:

Well the one I like best, everything has to do with oscillators - - mixers, synthesizers. These are the three things. And I've published a textbook in oscillators and synthesizers, one in communication receivers, and one in general microwave theory. So, all the combination of amplifiers, mixers, oscillators, synthesizers, and the whole spectrum is something I like very much in this challenging and changing world as new semiconductor devices come out. You always want to learn something new.

IEEE

Geselowitz:

Hmm. Interesting. So, I'd like to ask—though again, feel free if I miss something you want to fill in—I’d like to go back a little bit and find out when you first became aware of IEEE, and how you first became either involved or using IEEE conferences and publications.

Rohde:

Well, the IEEE involvement was unavoidable because my father was the one who started the IEEE Germany Section. So, he was the founding father of the IEEE in Germany. And, being the son, it was unavoidable to hear about it. And so, when I came to America, I got "a high recommendation" to become a member. And actually, I think we all should be very grateful that the IEEE does exist because of all the international connections and people you learn about and know. So, this was, and is, a very useful organization. At the Synergy booths during IEEE Conferences over the years I've met many people, I've made friends with many people. And I'm happy that the IEEE in its widespread form internationally does exist.

Geselowitz:

Mm-hmm. Did you get involved at all besides exhibiting Synergy, on the other side of the conference, presenting, helping to organize, and helping to referee papers? Did you get any, in that kind of involvement?

Rohde:

That's the most I did. I didn't go beyond sorting out and helping the IEEE to get certain things done. I avoided and will avoid all positions of power. That's not my life. I like to help and serve the IEEE. But there are people, more qualified to make political decisions than I am. I am not good in politics. And then my father accused me in his late days that I have two flaws. One, I'm too non-diplomatic, which means I say the brutal truth. And my father told me this wasn't a good thing. And I said I want to be rich enough to be able to say the truth. That defines me. And the second thing, he called me a socialist because I say coworkers, not employees. And this was the wrong message. Also, I believe in teamwork and people working together. Ultimately, somebody ends up being the team leader. But many of these more complicated things are joint effort.

Geselowitz:

I see. And which IEEE society or societies were most important for you, for your papers and your exhibits and your conferences? Because your work goes across a few areas of IEEE interest, ultrasonic frequency, microwave theory, information theory. You seem to have a lot of interests.

Rohde:

Well initially MTT, obviously, because of all those microwave things we've done. And then if you go back to my project with oscillators, that was frequency control. In 1978, I published a paper about atomic frequency standards and crystal oscillators and related topics. So, these are the two which were important. And then since one of my hobbies is radio amateur activity and radio amateur activity doesn't work without antenna, you need the medium to go from the electricity into the air, and so you need an antenna. Your neighbors don't always like it because it looks big and tall and might fall on their property. So, antennas became important and I ended up in the Antenna Propagation Society also. And I've been able to work with the SIGHT committee to support and help some of the humanitarian activities. There was a particular case where a lady

in a remote position needed a cellular tower for the town and she collected money so the people living in the vicinity of the tower had a chance to use cellular telephones. There were a lot of similar needs. And last time when I was in India, we were able to start a few IEEE chapters - - to help people.

Geselowitz:

Oh great, that's exciting. Because at IEEE, we're supposedly advancing technology for humanity and not just for its own sake. That's our motto. So, it's good to see you putting it in practice. When did you get interested in amateur radio?

Rohde:

Radio amateur goes back again to my father. My grandfather played with radios. My father had a ham radio at home and in the car, in the motorboat, everywhere. And I remember we went on top of mountains in Italy to see what the propagation was. In 1956 I got my own license. 16 years old at the time. It did two positive things for me. My geography knowledge improved, so I knew which country was where and which city was where. And besides never losing my German accent, as you can hear from this interview, at least my English vocabulary got pretty good. But even after essentially 50 years in America you still hear where I come from, so that's one of those unavoidable things. I've seen people who were in America for 30 years. Their English was lousy, German was lousy. At least my German didn't get totally defective. But my English never got perfect.

Geselowitz:

It's pretty good. Do you still do ham radio as we call it in the United States?

Rohde:

Absolutely, absolutely, yeah. And the justification for this, I expect anybody who reports to me in any decision function to have a ham radio license because once in your lifetime, you understand how radio communications from the antenna to the loudspeaker and the microphone to the antenna works, it's mainly - - that you know what's inside, what part of the circuit diagrams are essential, what you have to know and how to optimize it. So, that’s part of communication hardware theory and software theory. I think it's vital that you have a license. Otherwise I don't trust people that they can really do a good system if they don't really use it.

Career advice

Geselowitz:

So, I guess along those lines, we always like to ask what advice you would give to young engineers, either about their education or their career choices as they look ahead, just graduating, say with a baccalaureate?

Rohde:

I believe in today's world where commerce is worldwide, you do also need either an economics or law degree. You really have to know what you're getting into, and really have to have, especially electrical engineering or anything in science, whether it's a chemist, or I happen to prefer electrical engineering, but you need to understand both things. You cannot go to another country, another party, and negotiate a contract or a corporation without knowing, at the end of the day, this is a contract. It's a commercial transaction. You are not supposed to win friends or make enemies in these discussions. You'd like to have a stable arrangement which is good for both parties and a team effort. And therefore, you have to understand the economics and the law. And you cannot always have an economics expert and a law professor sitting next to you through this negotiation. You have to be using some common sense and education. So, my advice, anybody who can afford it and can do it should get a dual degree in economics and electrical engineering. From my background, I'm very fortunate that I'm an accredited university professor at several universities. So, I've helped many American students to get a Ph.D. in Germany, essentially with one ticket flying back, and not being charged $200,000 by an American university. These German institutions are fully accredited and in competition with American professors.

Geselowitz:

Now what about languages? Did it help that you knew German and English and some Italian? Or should one just assume these days that business will be conducted in English by everybody?

Rohde:

Remember I said before that when I went to Darmstadt there were these two professors, Zinke and Brunswick, and the German textbooks were in German. So, when Springer talked to me, I said the condition was that it must be in English, because that's the common scientific world. Everything is in English. Yes, the German helps me if I'm in Germany and where I can supervise Ph.Ds. And the way a German Ph.D. works, that you have at least three professors total who review the dissertation in English or German and give the oral examination. The last one I've done was in English. And English helps, but in Germany, it's good to have both languages. I think in English, most of the time. When I came to America, everybody told me to learn Japanese. The next recommendation was Chinese. Russian was in between. So, I'm not sure. But I'm quite happy that I can oscillate between German and English. And I'm happy that I can supervise some of these Ph.D. dissertations.

Geselowitz:

Oh, that's fascinating. Another question, you mentioned meeting over the years IEEE people through exhibiting at the MTT conference and so forth. But you didn't get involved in actually politics. Are there any particular IEEE individuals that you worked with who stand out in your mind?…

Rohde:

Absolutely, there are many: Madhukar Pitke, Shiban Koul and a lot of people who I've met. Of course, Ajay Poddar here at Synergy is another example - -. There are lots of people who either from America, or from Germany I've met. And going back to when my father started the IEEE activity in Germany, my father had a sailboat. And I also like sailing as a hobby. And so, one day in these IEEE things, my father invited Heisenberg on the sailboat. And I was about 12, 13 years old. I'm not sure about this. And Heisenberg is known for his uncertainty theory. And I asked him a physics question. I said why do we need these vacuum tubes, which get so hot, and you have the heater in there and all the garbage? Why don't we take a beta radiation isotope and get as many electrons as you want? He said yes, you're right. But you can't stop it. In a tube, vacuum tube, you have a negative grid voltage with which you can control the number of electrons you absorb. But here you have a continuous bombardment; you can't stop it. So, I wasn't smart enough to comprehend everything. But at least I got a feeling. I met Heisenberg, I've met many other scientists, or other people of importance on the sailboat, and I'm very grateful that this happened. Like Rizzoli via Raytheon. So, that's a very nice and powerful community. And it goes back to your other questions. MTT was the thing where I started, yeah.

Geselowitz:

Okay, that's fascinating. The Heisenberg theory is particularly fascinating. So, you mentioned ham radio and sailing. You have any other hobbies, or what do you do when you're not working? I know you're a workaholic, and you've built all these companies. But just say a little bit, can you say a little bit about your personal life or your social life?

Rohde:

I'm not only a workaholic. I think that a little, this was not a Freudian slip. Just for the record, I'm not. But yes, ham radio absorbs a lot of time. By the time you make a contact and then people want to know a little bit about you, and then just saying I hear you, I hear you. When I was younger, I was skiing, which I really liked. And then some people who were highly drunk ran into me and kind of ran over me, and ever since I got timid, I must admit, and gave it up. Likewise, I enjoyed playing tennis, and then I dislocated my shoulder, because I fell from my sailboat. So, I couldn't play tennis anymore. The key things I like are ham radio, sailing, photography, and RF/Microwave engineering. These are the things which occupy me most. And I like to see crazy movies. And anybody who sees this interview, go on the Internet and look for a television series called Professor T, with a capital T. This is an interesting series because it describes a professor of criminal psychology who does extreme weird things to solve problems. And there's very little action but a lot of thinking and analysis of situations. Like he says, everybody lies. And then he said here, I'm going to tell you a few lies. Then he gives you all these lies, but they are correct. He says it appears like a lie, but not every lie is a lie. So, he set the audience up. Very well done. It's currently on PBS, but you can also download it on the Internet. It's really intellectual, challenging.

Geselowitz:

Is it an American Series or a German series?

Rohde:

It's neither. It's in Flemish; it comes from Belgium. But it has English subtitles. So, if you can follow the subtitles, the language oscillates between German and English and Flemish. At times it sounds like a mispronounced German if you ask me. And so, I was able to decode it - -. But it's totally fascinating, there are two series. It's now shown on PBS, and it's extremely creative and intellectual.

Geselowitz:

I'll definitely look that up.

Rohde:

Professor T with a capital T, yes.

Awards

Geselowitz:

Right, that's interesting. We asked you about your particular, from your perspective, your developments you're most proud of. Are there awards or recognitions that you're most proud of, that you've received among your many, among your many accolades?

Rohde:

You mean which award was the best?

Geselowitz:

Yes

Rohde:

Because it's hard to say. I'm not into politics, as I said before, so I can't really evaluate from a prestige point of view what has the highest. I don't know these things. But I'm very happy that I have the IEEE UFFC Rabi Award and I have the top award from the Antennas & Propagation Society. But I'm not educated enough to understand from a political point of view, how you rate these things. That’s not something I'd like to get into. And Dr. Poddar who works for me and I we are currently doing work in metamaterial and some other crazy physics-based topics, and I really enjoy this, and awards are not the reason you do work, an award is a side effect. You're lucky if people like your work. You don't get an award if they don’t like you. At the end of the day, a product or something which you solved must be there. So, I think that's much more important to have measurable success. Some of these awards are highly political, so it’s hard to say how they are given.

Closing remarks, international communities and communication, work with Ajay Poddar

Geselowitz:

That makes a lot of sense. So, I think we've covered a lot of your career and your life. But this is your interview, so I just want to ask you are there is anything I missed, anything that you would like to add at all that we did not talk about yet?

Rohde:

Well the one thing I'd like to add, coming from Germany, I became a member of the Academy of Science in Germany, which is a big honor. There are only two honorary members, and I'm in science and mathematics. And the other one is in political science. And you can see this from this plaque back here, that among the other nice things, they did a survey of top products, instructors and people, and I ended up among the microwave people selections, a group of 25. It was fairly scary because by the time I got the award, among the people who were these top people; I was the only one alive. This was not a good feeling; it was not a good message I derived from this. The best hardware ever was the network analyzer by HP. And then of course institution, some university. It gives a list of people, who dominated the microwave field, and every name you read is dead, and the next one in line to be dead. At the time I didn't laugh, and nowadays with the Coronavirus, yeah, it's, I mean it's a real thing. And I remember my father used to say my purpose in life is only to go to funerals. So, what is mine? And so, the current situation is depressing. And here in our company, I survived it, but no other employees here got it, so we are lucky. It's unclear how I got it. But it's a very strange feeling if in a list like this you're the end of the tail. I was shocked actually. I'm also shocked to be selected. I mean a lot of people were angry they didn't get elected. But sometimes it's luck. I'm too honest and too direct; I don’t qualify for these things very well.

Geselowitz:

Well despite that, despite your father's complaint that you're too blunt, you seem to have done pretty well. So, is there anything else? Any last words or things you would like to add to this fascinating conversation?

Rohde:

I'm not sure; let me think for a minute or two. Yes, I think that I should mention that as I said, I'm working with Dr. Ajay Poddar. We have, besides the metamaterial activities, done a lot on opto-electronic oscillators with Drexel University; we made quite success in low phase noise systems. For MEMS application, we used the Casimir effect. It's an interesting effect - - look up in the Wikipedia. And I traveled worldwide with IEEE. I mentioned that I went to India, and we started a few chapters. Ajay and I were in Germany, found out they had a hotel for blind people. And I donated a complete radio system with antenna to these people so they can connect with the world. Ended up getting all radio licenses and went on the air. And we have collaboration with Drexel University and others, and I ended up being an honorary professor at some of these

places. But I mean you can see from the presentation, I'm probably too direct. My father is correct. I'm sure there are people who will see this interview who will make some similar comments.

Geselowitz:

So, I think it was a fascinating conversation. But it does actually make me think of another question, a subjective question. Do you think your directness was more of an issue in Germany or in the United States? Which culture values directness more, and which culture values diplomacy more, would you say?

Rohde:

This is clearly a pro-America statement. In Germany, you can intimidate and affect people negatively if you say things there. In America, you have much more freedom of speech, not only by the Constitution guarantee, but people are more willing to listen to new ideas and do things. I remember before I said I would like to go to America and be at these international conferences. My boss went there, so he went to America, didn't understand much came back with nothing. And I had to find out how things were. So, you're absolutely right. That's the beauty of America and the IEEE; things are open. And now that English is the common language, these things are much easier. And Germany at times was very rigid. And I define three types of truths. One is insulting, yesterday you looked much better. Nobody wants to hear this. Then it's absolute. Its 95 degrees right now in Paterson. That’s not good news either. And then if you stage an accident on a crossing, and then you ask all the witnesses what they saw or missed, how many wrong statements you get. So, it's relative truth. People think what they saw. And I think eyewitnesses in many courts they have sent people to prison for the wrong reasons because the witness was too preoccupied, didn't admit that they are unsure of what they saw - - I call it lying by omission. They didn't really see everything, but they were asked - - I don't know - - people in jail because - - so this is my opinion about seeing the truth. You have three forms of truths. The first one is insulting, the second one is scientific, and the third one is dubious, because you recall things you like to recall and not things you do see.

Geselowitz:

Right, the famous Japanese director Akira Kurosawa has a movie Rashomon, which is on that exact theme. There's a crime, and everybody remembers it differently.

Rohde:

I'm sure.

Geselowitz:

So, very fascinating. Okay, so I don't want to cut you and I want to give you one more chance to add something, but I think this was a wonderful interview. I think it's going to be a fantastic addition to our collection. I really, really thank you for your time, because I know how busy you

and Ajay are. And I imagine that under the conditions, I don't know if you have your full workforce or what the exact conditions are, but I'm sure it's difficult to work under these times.

Rohde:

Well two last statements. One, we run about 40% of the employees, only essentials here, with two shifts. And if you consider me an employee, I'm the only one who got sick. Everybody else is in good shape. We pay attention so nothing happens. The company's stable. We're doing well both in orders receiving and shipping. And last but not least, thank you for very much for the opportunity to have this frank discussion. And I try to be as undiplomatic as I can be so…

Geselowitz:

As the English poet and playwright Shakespeare said, to thine own self be true, or that's who you are, so…

Rohde:

I'm what I am. And again, thank you very much for allowing me to express my opinions.

Geselowitz:

And thank you, I really appreciate it very much.

Rohde:

Likewise, Good-bye.

For additional information readers may want to visit following websites that are in public domain.

- https://ieeetv.ieee.org/ieeetv-specials/heritage-circle-rohde
- https://www.rohde-stiftung.de/en/rohde-foundation/ulrich-l-rohde.html
- https://www.unibw.de/universitaet/ehrensenatoren/prof-dr-ulrich-rohde
- https://www.b-tu.de/en/endowed-chair-rf-and-microwave-techniques
- http://care.iitd.ac.in/People/Faculty/rohde.html
- https://forums.qrz.com/index.php?threads/great-technical-references-from-n1ul-dr-ulrich-rohde.714580/
- https://www.unibw.de/technische-informatik/mitarbeiter/professoren/prof-dr-ing-habil-dr-h-c-mult-ulrich-l-rohde
- http://www.arrl.org/news/ulrich-l-rohde-n1ul-named-as-honorary-fellow-of-institution-of-electronics-and-telecommunication-eng

Photo gallery

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  Photo is taken in year 2015, shows Dr. Ulrich L. Rohde and Dr. Ajay K. Poddar received the Award from IEEE IFCS In year 2015: from left-Dr. Ajay Poddar holding Plaque for IEEE W. G. Cady Award and Dr. Ulrich L. Rohde is holding the Plaque I. I. Rabi Award. Dr. Rohde has received the award "For intellectual leadership, selection and measurement of resonator structures for implementation in high performance frequency sources, essential to the determination of atomic resonance" https://ieee-uffc.org/awards/frequency-control-awards/rabi-award/ Dr. Poddar received the award for "For the analysis, design, and development of a host of frequency control products exhibiting state-of-the-art performance, including the development of extremely low noise crystal oscillator circuitry" https://ieee-uffc.org/awards/frequency-control-awards/cady-award/

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  Photo is taken on Sept 28, 2019 at 62nd Annual convention & International Conference, venue: Dr. Ram Manohar Lohia Avadh University, Ayodhya, India. https://www.youtube.com/watch?v=5MDJBdpIsiY Dr. Ulrich L. Rhode was honored by prestigious IETE Fellow for his 5 decades of scientific and professional career, invited for giving a talk at the 62nd Annual convention & International Conference, Sept 28-29, 2019, venue: Dr. Ram Manohar Lohia Avadh University, Ayodhya, India. Dr. Ulrich L. Rohde and Dr. Y. S. Rajan, Space Scientist-ISRO, India depicted third and fourth from left in photo.

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  The photo is taken on Sept 16, 2016 at Dr. Rohde's house, New Jersey, depicts from left Dr. Madhukar Pitke-Retired Scientist and Professor from TIFR-India, Dr. Ulrich L. Rohde discussing about his invention in the field of SDR and HAM Radio.

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The photo is taken in Aug 2018 at Dr. Rohde's company (Synergy Microwave Corp., New Jersey), depicts from left Dr. Ajay Poddar- Chief Scientist Synergy Microwave, NJ; Dr. Madhukar Pitke-Retired Scientist and Professor from TIFR-India, Dr. Ulrich L. Rohde discussing about various technology for the humanitarian applications.

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The photo is taken in June 2018 at IEEE IMS in Philadelphia, depicts from left Dr. Shiban Koul - MTT Professor at IIT Delhi, Dr. Ajay Poddar- Chief Scientist Synergy Microwave, Dr. Ulrich L. Rohde discussing about providing technical guidance and establishing new IEEE Chapters at IIT Jammu and IIT Kanpur.

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The photo is taken in October 2015 at Oradea University Romania, depicts from left Dr. Constantin Bungau, Rector University of Oradea, Romania; Dr. Ulrich L. Rohde, Dr. Ajay Poddar, and Dr. Marius Silaghi, Professor at University of Oradea, Romania. Dr. Rohde was invited for joint collaboration project activities for creating new jobs in the field of medical and humanitarian applications.

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The photo is taken in June 2015 at IEEE International Microwave Symposium, depicts from left Dr. Ulrich Rohde standing number 6th.

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The photo is taken in June 2018 at IEEE International Microwave Symposium, MTT-22 meeting, depicts from left Dr. Ulrich Rohde standing number 5th.

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  The photo is taken in June 2018 at IEEE International Microwave Symposium Exhibition Booth, Dr. Rohde is showing the world-best OEO (Tunable Ka-Band Synthesizer using Opto-Electronic circuits) at his company Synergy Microwave booth to IEEE AP-S President Prof. Ahmed Kishk-standing first from right and Prof. Tapan Sarkar first from left, Dr. Ulrich Rohde is standing second from the left.

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  The photo is taken in April 2015 at IEEE IFCS, depicts from left Dr. Ulrich Rohde, Nobel Laurette Prof. Joe Taylor is standing from right, and in the middle, Mrs Taylor.

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  The photo is taken in March 2013 at Synergy Microwave Corp., New Jersey, depicts from left Dr. Ulrich Rohde, Prof. Tatsuo Itoh, UCLA, Los Angles, California, and Dr. Ajay Poddar. Prof. Itoh visited Synergy Microwave Corp., for joint Collaboration research project meeting for the development of Metamaterial Mobius technology for the applications in sensors and resonator.

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  The photo is taken in October 2013 at Synergy Microwave Corp., New Jersey, depicting from left Dr. Ulrich Rohde and Dr. Ajay Poddar; holding Microwave Journal cover page of Magazine, highlights the invention of Metamaterial Mobius Strips for resonator and sensor applications.

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  The photo is taken in Feb 2019 at Synergy Microwave Corp., New Jersey, depicts from left Dr. Ulrich Rohde standing 4th in the row, handing over plaque to Prof. Meisong Tong, IEEE AP-S Distinguish Lecturer from Region 10, Shanghai, China.

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  The photo is taken in June 2016; Dr. Ulrich Rohde is handing over the plaque to Dr. Anisha M. Apte for securing first place in IEEE MTT-S IMS SDC (Student Design Contest).

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  Year 2004 - Dr. Ulrich Rohde is evaluating two-tone intermodulation test from

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  The photo is taken in 2013 at Bavarian Academy of Sciences and Humanities. Munich, Germany; the celebration was in the recognition of appointment of Dr. Ulrich L. Rohde as Member of Board of Trustees and member of Bavarian Academy of Science, Munich, Germany. From right, Dr. Ulrich L. Rohde is shown in the photo, and from left Prof. Karl-Heinz Hoffman, President of the Bavarian Academy of Sciences and Humanities, Munich, Germany; his wife Mrs. Hoffman is standing second from the left.

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Photograph shows the partner of Rohde & Schwarz, discussing on the financial health and growth of the company; from right Dr. Ulrich Rohde and Mr. Friedrich Schwarz, this shows the harmony and balance between the partners of the privately held company.

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Photograph of Rohde & Schwarz partners/owners family members, taken in year 2009. From left standing: first is Dr. Christina Rohde (Daughter of Dr. Ulrich L. Rohde), second is Dr. Ulrich L. Rohde, from left sitting on chair, first is Mr. Friedrich Schwarz, second is Dr. Ulrich Rohde' sister. Rohde & Schwarz was founded 85 years ago by university friends Dr. Lothar Rohde and Dr. Herman Schwarz and is headquartered in Germany, Munich. As an independent, privately owned company, Rohde & Schwarz generates its growth from its own resources. Since the company does not have to think in terms of quarterly results, it can plan for long term. Rohde & Schwarz has approximately 12,000 employees, about 7000 of who work in Germany.

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Dr. Rohde and his team won several times, best in Club (First place); shows his hobby, and participation in Boat race competition as Boat Captain.

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Dr. Rohde and his team won several times, best in Club (First place); shows his hobby, and participation in Boat race competition as Boat Captain.

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Here is Dr. Rohde and his team in Antigua receiving the First Prize for the International Antigua Regatta, cruising class. His team and he won the prize in two consecutive years out of a total of more than 100 boats

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  Dr. Rohde and his team won several times, best in Club (First place); shows his hobby, and participation in Boat race competition as Boat Captain.

Written responses to general questions

Written responses to general questions, July 7, 2020 (pdf