

The Accidental Inventor: An Interview with Hal Philipp

<https://mindmatters.ai/podcast/ep355>

Announcer:

Greetings and welcome to Mind Matters News. Recently we had the fantastic opportunity to sit down in person with the inventor of the modern touchscreen Hal Philipp. In honor of this special occasion, we also have a video version of this podcast available on our YouTube channel. If video isn't quite your style, no worries. We'll be airing all three parts right here in audio form as usual. To kick things off, let's start at the beginning and cover some of Hal's early inventions. Here's your host, Robert J. Marks.

Robert J. Marks:

Greetings, and welcome to this great interview that we're going to have. We're going to be talking to Hal Philipp. And Hal Philipp is one of the great entrepreneurs and inventors, I think, of the 20th century, and we're going to get into that. I would be very surprised if today you haven't used some of the devices and some of the technology, which is developed by Hal Philipp. I'm joined in the interview by Bradley Norris. Bradley is the director of the Technical Entrepreneurship Program at the Baylor Business School, and he's going to be helping me do the interviewing. So, I'd like to introduce you to Hal Philipp. And Hal, I know you love doing stuff like this, right? Are you having fun yet?

Hal Philipp:

Oh, we're having a lot fun, Bob.

Robert J. Marks:

You're having a lot of fun here. What I want to do is just kind of start out from the beginning. You went to Michigan Tech?

Hal Philipp:

I did.

Robert J. Marks:

And your brother went with you, didn't he?

Hal Philipp:

No, no. He was nine years older. He went earlier.

Robert J. Marks:

Oh, he went earlier.

Hal Philipp:

He studied chemistry.

Robert J. Marks:

Magnus, yeah. And your brother is a professor or professor who retired, right?

Hal Philipp:

Yeah. He's retired now. He's going to be 80 this year. He was the head of the biochem department at City University of New York at CUNY for many years.

Robert J. Marks:

Okay. So, after you graduated from Michigan Tech, you went to work for Tektronix, which is one of the big electronics firms. Could you tell us some of the stuff you did when you first started out?

Hal Philipp:

Well, actually, I worked for the National Bureau of Standards before Tektronix.

Robert J. Marks:

Oh, I didn't know that.

Hal Philipp:

You didn't know that?

Robert J. Marks:

No.

Hal Philipp:

Okay. We didn't talk about that. Yeah, I worked for NBS. It's now called NIST.

Robert J. Marks:

NIST, okay. So what standards were you... You have standards, I guess, right?

Hal Philipp:

Fusion plasma physics, believe it or not.

Robert J. Marks:

Really?

Hal Philipp:

Yeah, I wasn't aware they were doing that kind of stuff, but in the development of fusion reactors, they needed to have calibration data for contamination ions in the plasma. And they were working on that. They had a theta-pinch reactor. So, I worked on instrumenting that, doing the control systems and data collection.

Robert J. Marks:

So, how long did you work for NIST?

Hal Philipp:

That was about three and a half years.

Robert J. Marks:

Three and a half years. And then you went to Tektronix.

Hal Philipp:

Then I went to Tektronix, yeah.

Robert J. Marks:

And at Tektronix, you were... I talked to him before. You were in charge of developing technology for optical time-domain reflectometers?

Hal Philipp:

Yeah.

Robert J. Marks:

Was that your first patent?

Hal Philipp:

Yeah, I had developed the time base for the first world's first OFTDR, optical fiber time domain reflectometer, yeah, OFTDR.

Robert J. Marks:

Okay. That's easy for you to say, right? So, could you explain what an optical time-domain reflectometer is for the layperson?

Hal Philipp:

Yeah, sure. So, a TDR, time-domain reflectometer, basically sends out a pulse of energy into some medium. It could be into space, it could be into, in this case, a fiber optic or a piece of wire. It works like a radar, so it looks for the reflections that are coming back. And based on the signal that's coming back, you can determine the attenuation of the fiber, you can determine if there are any breaks or anything special about the fiber, some dispersion characteristics. So, that was necessary to lay all the long lines in fiber optics throughout the ensuing years. This was in the late 70s, this was developed. And so I worked in the TDR group, and at Tektronix, they were doing wire TDRs. And they had a mission to do a fiber optic version of that, so that's what I worked on. My contribution was the time base. It was a quasi-digital/analog time base, and I got a patent on that. I also did the control systems for based on a Z80.

Robert J. Marks:

Okay. Now that patent is long since expired.

Hal Philipp:

Oh, yeah, long time.

Robert J. Marks:

You were a young guy when you did that, right?

Hal Philipp:

Yeah, yeah, this was in the 70s, a while back.

Robert J. Marks:

All-in-all, I talked to Hal before. He has 98 US patents, 98 US patents. That doesn't include the foreign ones.

Hal Philipp:

That I know of.

Robert J. Marks:

That you know of.

Hal Philipp:

US ones too.

Robert J. Marks:

And you've lost track of a lot of your patents, right?

Hal Philipp:

Yeah. I don't monitor them anymore. I'm out of the game.

Robert J. Marks:

You don't monitor them anymore. So, how long did you work for Tektronix?

Hal Philipp:

That was close to five years.

Robert J. Marks:

Five years, and then you decided to go into consulting business?

Hal Philipp:

Yeah. Since I had done a patent, you kind of get a taste of inventing. So, my idea was I would go out on my own and develop my own patents and then license them. So, that was the basic mission that I set myself onto. And I promptly starved, of course. It was a lot harder than it seemed, and so I ended up consulting back for Tektronix and for other startup companies in the Pacific Northwest. But I did eventually file a patent on something.

Robert J. Marks:

On something.

Hal Philipp:

On something.

Bradley Norris:

So, I want to clarify. You were starting independent consulting as independently on your own?

Hal Philipp:

Yeah. I just quit tech one day and started consulting. But I had a contract for another company that was doing optical fiber work. It was called Photon Kinetics. I think they're still in business today. So, I worked for the founder... His name was Phil Shearer, Dr. Shearer... and in his garage, literally, and did optical optoelectronic stuff for him. Yeah, that was my first contract job.

Bradley Norris:

And did you ever expand the team and have others join you?

Hal Philipp:

No, I was a lone guy. I was a lone wolf. Yeah, that was me, so I just enjoyed working on my own. Yeah.

Robert J. Marks:

And he did everything. So, tell us about one of your first patents that has to do with... Well, in Texas, I was mentioning to us the number one religion is Christianity. Number two is football. And so, the second patent that you had was on football. So, what'd you do on football?

Hal Philipp:

Well, I was approached by a Texan guy who was a recruiter. He had been a football coach, and his objective was to be able to have some portable gear that he could take with him to high schools to recruit students for football. And the objective was to measure athletic performance in terms of agility and speed, both in combination. So, he developed a kind of a maze system, or he had this idea for a maze system, where the runner would start out at point A and then run down the field. And then there would be a light at the end of the field, which would indicate turn left or turn right. And so the person had to turn right, there'd be another light, and turn left again, and zigzag down the field, and finally end up at the final destination.

And for this, I needed to develop an optical sensor that could detect this person running by this particular position, and then some radio technology to control the lights and to measure the timing. And the optical sensor was very critical, of course, had to be very fast, very high speed, and low power, because it all had to run in batteries. Everything was set up on tripods, not cables. So, that was my first taste of optical sensors. But I'd been working at Tektronix in the optical business anyway. So, it wasn't like it was alien to me. But that's where I really started-

Robert J. Marks:

It was a football pad.

Hal Philipp:

Well, it's based on football.

Robert J. Marks:

So, was the idea for the runner, the offensive runner, to be able to look at these lights down the field and tell which way to go?

Hal Philipp:

Well, it's the human reaction time, seeing the lights, not knowing which way the lights are going to go. So, you get to a certain point, pass a certain sensor, and then a light flashes on the right, and they have to turn right real quickly. And some people would turn the wrong way in anticipation. So, this is a failure. So, these guys didn't survive. So, you have to really react quickly to the stimulus.

Robert J. Marks:

But you couldn't use it in a football game.

Hal Philipp:

That's not the point.

Robert J. Marks:

Okay, I missed the point.

Hal Philipp:

It's just recruiting, just for recruiting.

Robert J. Marks:

For recruiting.

Hal Philipp:

It's just recruiting.

Bradley Norris:

Measurement of success, right? Measurement of reaction times.

Hal Philipp:

It's a quantification of reaction time and speed.

Bradley Norris:

And speed.

Robert J. Marks:

I see. Okay.

Bradley Norris:

Both agility and reaction time and speed.

Robert J. Marks:

Okay, so you got a patent on that?

Hal Philipp:

No, actually not on that one.

Robert J. Marks:

Oh, you didn't?

Hal Philipp:

No, but that got me into optical sensors.

Robert J. Marks:

Optical sensors. Okay.

Hal Philipp:

And that's when I started thinking about improving that to reduce the power consumption of the, because these sensors consumed a lot of power. They were active infrared, so they sent out pulses of infrared light and looked at the reflection coming back. And to get good response time, you needed to reduce the signal or increase the signal-to-noise ratio, so that implied a lot of power output. And so yeah, that consumed a lot of battery. The objective was to reduce the battery consumption. That's where I got into the patent on the next technology piece.

Robert J. Marks:

Okay. And you and I published a paper on that.

Hal Philipp:

We did. It was called the photon bridge.

Robert J. Marks:

The photon bridge. I remember that. Yeah.

Hal Philipp:

It was based on the idea of darkons.

Robert J. Marks:

Darkons, You guys know what a darkon is?

Hal Philipp:

Photons versus darkons.

Robert J. Marks:

Yeah, Darkons are absence of... It's probably like electrons and holes in semiconductors.

Hal Philipp:

Kind of, yeah. Yeah, yeah, yeah.

Robert J. Marks:

Okay. So, a darkon is the absence of a photon. So, there's a lot more darkons than there are photons in the world. Right. Okay. So, that's interesting. So optical sensors, tell us about optical sensors and maybe the door opener and the state of the door opener when you started to look at it.

Hal Philipp:

Yeah, so once I had the patent on the photon bridge sensor, I was looking for other applications. So, the guy-

Robert J. Marks:

First of all, describe the photon bridge.

Hal Philipp:

Yeah, the basic idea of the photon bridge is to create a linearization of the PIN photodiode. So, PIN photodiodes have non-linearity. They have a lot of noise issues and kind of a dark response curve at the bottom end. And so, you had to have some way to lift the curve up a little bit and also to create a more linear response, so that when ambient light changes, it doesn't change the response of the sensor. So, the basic idea was to create a summing junction at the PIN photodiode. How do you do that? Summing junctions are made of the signal coming in and also a negative signal coming back, some feedback coming back to the diode or to the summing junction to create a negative or a null response. And so, the idea of the photon bridge was, well, you have the light coming... you have an infrared emitter sending a beam out to the object that you're going to sense. The reflection is coming back. It's very weak.

And then it's in pulse form, so the pulses are coming in. Of course, you amplify that, but before you amplify it, you send another set of optical pulses to the PIN photodiode. But these pulses have to be in opposition to the pulses coming in. So, you have to think of them as darkons. So, you want to cancel out the light coming in this way by another stream of light coming in this way. How do you create darkons? Well, the basic idea was actually pretty simple. You just shine the LED light onto the PIN photodiode all the time. When the pulse is coming in, you turn it off. So, you're creating a negative pulse, and this does the job, and everything is AC coupled, so the DC component falls out. That's it. That was a patent.

Robert J. Marks:

Yeah. Okay. We'll give Hal's email in case you have any questions about that explanation.

But I remember visiting Russia during perestroika, right when Russia was falling, and going to one of their fancy hotels and going in their elevator. And one of the things I noticed is when the doors opened, you could not go like this and keep the doors from closing anymore. They would just close in, and they would crush your arms. So, you did a lot of work on door openers. So, what was the deal there?

Hal Philipp:

Well, so the first real application, the first license deal I ever did, was for automatic doors, the kind of sliding doors you see in airports and so on and so forth, which are everywhere today. The problem was that in the door industry, there was no light curtain or safety system. So the doors would oftentimes come closed on people, and people get injured, and there were a lot of lawsuits because of this. So, children get knocked over, elderly people get knocked over, and of course, you don't want to hit people

with these doors. So, the basic idea that I developed was a light curtain from above using the sensor, so active infrared pulses of light coming down from the top of the door in a fan shape on both sides of the sliding door, and then looking at the signal coming back, and again, using the photon bridge technology was ultra sensitive compared to the current state of the art at that time and then processing that to see what the differences in reflectivity were.

And it's really interesting because you think that dark clothing like this would be non-reflective, but actually in the infrared spectrum, it could be quite reflective. So, it generally saw pretty much everything, and it solved basically a huge problem for that industry. And that was the first license deal I did. And that was to a Swedish company called Besam out of Landskrona, Sweden.

Robert J. Marks:

Do you know whether or not that technology is still being used today? It sounds like a pretty universal way of doing things.

Hal Philipp:

I have no idea.

Robert J. Marks:

You have no idea?

Hal Philipp:

I have no idea. I didn't track it after that. I got pretty busy with other stuff.

Robert J. Marks:

Okay. Well, another one was the faucet, the automatic faucet. Everybody has used the faucet where you run your hand under the faucet and the water starts coming out. Tell us a story about that. That's an interesting path.

Hal Philipp:

So once I did the license for Besam, for the sliding doors, I was looking for other applications. The license agreement was specific to automatic doors, so that left the entire rest of the universe open for other license agreements for other applications. One obvious one was automatic faucets, so stick your hands under, the water comes out. And in fact, they had a pretty big problem because they had a lack of sensitivity and there was color sensitivity. So depending on your skin color, it might not work, and so on, so forth. And also they had issues with-

Robert J. Marks:

So, what you're saying is some of these early faucet detectors were kind of racist, right?

Hal Philipp:

A little bit. Yeah. Yeah, they could be.

Robert J. Marks:

Okay. So, you wanted to get around that?

Hal Philipp:

Yeah. Yeah. But generally just to make it more sensitive and more reactive and have the potential for a battery operation as well.

So, I worked on those and sold a bunch of licenses in that area to different faucet companies.

Robert J. Marks:

Okay.

Bradley Norris:

Okay. I going to pause you for just a second.

Robert J. Marks:

Sure, no, no, no.

Bradley Norris:

You said it was a super obvious application. What made it obvious to you?

Hal Philipp:

To me?

Bradley Norris:

Yeah. You've got what I would call a technical trick, an understanding. You can use your efficient light-reflecting measurement tool to measure a variety of things. I can imagine applications... We could make a list of 200 different applications. How did this one jump out at you? Why did you see this as the problem you could solve?

Hal Philipp:

Well, like everybody else, I am out there in daily life and seeing things, and you go to the restroom and airports and there are these automatic sensors. They didn't work very well.

Bradley Norris:

So, I remember the early days.

Hal Philipp:

It didn't work very well.

Robert J. Marks:

Yeah. There were crushed people lying all around.

Hal Philipp:

So, it just seemed kind of obvious that they might have an interest in that. And they did. They absolutely did.

Bradley Norris:

I'm curious about those first phone calls. So, you're calling a faucet company?

Hal Philipp:

Yeah. There was no internet at the time, of course. This was like 1992, roughly '93, '94, even earlier. No, actually, sorry, it goes around 19... Not '92, yeah, '87, '88. I'm trying to think of the timeline. It's been a while now, so a few years. But yeah, I would just go to the library and look up in directories of different industries and who were the major players. And they generally had phone numbers and addresses, so I'd write letters to people or call them up. And it was cold calling, but that was okay.

Bradley Norris:

And how many companies did you contact?

Hal Philipp:

Oh, dozens. It's a numbers game. It's like many things.

Bradley Norris:

And how many responses? Thank you for that. I appreciate that, the numbers game reference, because I agree. I think this is one of those things where you have to have a lot of conversations to get traction, but so dozens of contacts, attempts. How many conversations resulted, and then how many hits or contracts?

Hal Philipp:

Well, I got a lot actually. In this particular case, I hit it right on with the faucet industry. It was a hot issue.

Bradley Norris:

Serious pain point for them.

Hal Philipp:

It was a serious pain point. So, I got responses from just about everybody. That doesn't mean I did a deal with everybody, but I did a deal with several. So yeah, it was very worth doing. And again, it was pre-internet, so you had to wait and get responses and call people and call people again. But yeah, it was worth...

Bradley Norris:

And some of these faucet companies would be international, right? I'm sorry, I'm diving a little deep on the-

Hal Philipp:

No, they were really domestic.

Bradley Norris:

Mostly American. So, your US patent applied-

Hal Philipp:

They're American. For example, T&S Brass, Sloan Valve Company, Chicago Faucets in particular, these kind of companies. In fact, you go in the restroom here and you see these brands. Zurn was one of them. I think you have Zurn. I saw in the toilet you have Zurn flushers. So, I talked to almost all these companies. It's pretty funny.

Robert J. Marks:

Wow. I'm going to ask Bradley a question. I used the word pain point. What do you mean by that?

Bradley Norris:

Pain point, that is, as entrepreneurs, we want to respond to pains that people have, and in this case, dysfunction in the faucet or errors in the faucet. If it's causing some sort of level of pain, in particular a level of pain that people would be willing to pay for a solution, that's where it gets interesting for us. And so, I think it's interesting that, first of all, it came from your lived experience, which it doesn't always. There's way more pains in the world than any particular individual would experience, but in this case, you hit on one that was very common and broad. So, we're looking for those broad potential marketplaces, so a lot of people having the pain or a high value of the pain being experienced.

Hal Philipp:

I also want to say that one of my objectives was to remain independent as an independent consultant/inventor. The inventor lifestyle of developing patents and doing licensing, getting checks in the mail, it's very attractive. You get all the holiday you want, you can do almost anything. It's a good life. It's a really good life. And you can use that money to parlay into other things that you might want to do, other kind of business opportunities or technologies. So, I had a good income stream from these patent licenses. It was really, really good. That was kind of my dream, and I wanted to keep doing that, because it was a lot of fun too. I got to meet a lot of interesting people. I got flown to different countries. It's really a great lifestyle. There's a very dark side to this business though, which I'll tell you in a little bit, but if you can conquer the dark side, it's a very alluring way to have a career.

Bradley Norris:

I want to go back even a little further in your story, if I may. It took a lot of courage to step out from a place of employment first with NIST, then later with Tektronix, and then to strike out on your own. Now, I know you had a contract in place. Maybe it was a side gig for you in today's parlance, a side gig you had, but you leveraged that. How were you able to wrap your mind around the courage necessary to step out on your own?

Hal Philipp:

Oh, I was a very foolish guy. I didn't think too long and hard about it.

Bradley Norris:

There's power in young and foolish.

Hal Philipp:

I always knew that I could go back and get a day job, so having that as a backstop obviously helps. So, I just went to the very limit of whatever pain I could tolerate. And if it got too bad, I would just go get a

job. So, it's okay. It was cool. I didn't have expensive habits or expensive women or expensive anything, so I didn't have a lavish lifestyle to support. It was really just about getting out there and having this entrepreneurial attitude and developing something that people could use and something people would pay me for. And I could live into retirement with a nice income stream. It's not a complicated proposition, just an interesting way to view a career option.

Bradley Norris:

Thank you.

Hal Philipp:

Unlimited holidays, you could work on the beach. What's wrong with that?

Robert J. Marks:

Before we get to the touchscreen and the evolution of your ideas on touchscreen, let's talk about the dark side. What are some of the dark sides that you've experienced as an entrepreneur and a developer?

Hal Philipp:

Can we do that later in the-

Robert J. Marks:

You want do it later?

Hal Philipp:

... the context of you-know-who?

Robert J. Marks:

Oh, okay. We'll do it later.

Hal Philipp:

We'll continue in the context of you-know-who.

Robert J. Marks:

I have no idea who you-know-who is, but we'll go with that.

Hal Philipp:

Yeah, you do. You know full well.

Robert J. Marks:

Okay. Well, the next one is something that everybody uses today, which is the modern touchscreen, which was an invention and a patent, one of the 98 patents that Hal did. And I think it's just extraordinary. I mean, we all used automatic door openers. We all use the automatic faucets. We all use the football software, right? No, I guess we don't. That one kind of missed, but we all use the modern touchscreen, but this did not happen all at once. So, Hal, would you go through this? You developed

different levels of the capacitive sensor for touchscreen, and yours wasn't the first touchscreen, but the previous ones were kind of stupid.

Hal Philipp:

Can we back up just a little bit, Bob, just a little bit. Back up.

Robert J. Marks:

Back up. Consider myself backed up.

Hal Philipp:

So, we didn't get to how I did the capacitive. We're talking about the optics, so we never got further than-

Robert J. Marks:

The optical to go to the capacitive. Yes.

Hal Philipp:

So, one of the requirements I had from plumbing companies was to develop a sensor that could last for five years on batteries. And even the sensor I had couldn't do that. It could last for maybe a year, but they didn't want to replace the batteries so often. And rechargeables were not a thing back in the early 90s. So, I thought about other technologies to replace the optical sensor, because it was just too power hungry. And I went through passive infrared, I went through RF, I went through whatever you can imagine, acoustic everything, and finally, I just hit on capacitive sensing. And I had the technical background to do capacitive sensors, but capacitive sensors at that point had a pretty sketchy history. They weren't very reliable, they were expensive, complicated, they weren't self-tuning, they were subject to interference from all kinds of radio sources, and so on.

So, I went in with a little bit of trepidation to see if... It was fraught with some risk, but hey, I was getting paid license money, so it was another activity to try. And in fact, I was able to develop a new kind of sensor, which I called the charge transfer sensor. And in this particular scenario, I would use just digital switches to charge and transfer charge from an object. And in doing so, you could measure extraneous capacitance. So if we took Bob's phone here as an example. So, if I may.

Robert J. Marks:

Okay. Yeah. Oh, please.

Hal Philipp:

So, if we wanted to turn this into a sensor, what we do is connect a wire to it. This is mostly metal, so we connect a wire to it and to a switch, which charges this thing up to a particular voltage. Let's say it's five volts. Then we open the switch, and that leaves the charge suspended on the phone, and then we have another switch which transfers that charge into a capacitor, which is a storage device.

So, almost all the charge is transferred into a much larger capacitor. You can measure the voltage on the capacitor, and that will give you an indication of how much capacitance was there. Now, if you change the capacitance by moving your hand around this object, you'll change the voltage on the storage capacitor by microvolts, not very much, but enough... It depends on the signal-to-noise ratio... but enough to get some signal out of it. And the question was how to do that cheaply and economically and

to make it very reliable. And it turns out this digital method of capacitive sensing is extremely robust. You can do frequency hopping, you can do spread spectrum stuff, you can have narrow pulse widths and so on to suppress moisture films, and you can do all kinds of tricks with the switches. And they're very cheap, of course. And that was the basis of the next patent that I did, which was the charge transfer capacitive sensor. And that's what led me into all these other things we've been talking about, including touchscreens.

Robert J. Marks:

Including touchscreens.

Hal Philipp:

Including touchscreens. Yeah.

Robert J. Marks:

So, you've shared with me the epiphany that you had. I would call it a flash of genius, where all of a sudden you had the realization that you could do something with a specific chip that later you found out that the manufacturer of the chip said you couldn't do. But you had this thought that raced through your head. So, could you kind of reconstruct that scenario? I think you were just sleeping at night or something, or trying to sleep with your mind racing.

Hal Philipp:

Yeah, my mind is racing right now at what point I should pick it up on that. So going from that particular circuit, which had a number of discrete components and a microcontroller and so on, it was still pretty expensive, but it did solve the plumbing problem. The question was how to reduce that in size and cost and make it really super small and super cheap. And the customers for this particular sensor that I just described were mostly industrial sensors and things where they could still tolerate some cost. And the plumbing companies, of course, I did a license for it in that business too. So, that was okay, but for consumer devices, it was still way too expensive. We're talking maybe 20, \$30. And so the question was what do you do? And one night falling asleep, I was mulling this over in my head, and it just came to me that I could take a single-chip micro, like an eight-pin micro from Microchip, a 12C, 12LC, whatever it was, 508 or whatever, and manipulate the switches in the output ports between tri-state mode and switching high and switching low.

If you take two of those pins on the microcontroller and you develop a certain pattern on these switches, and you have an external capacitor, which is the hold capacitor that I mentioned before, the storage capacitor, that's between the two pins. And then you have a lead going out to the sensing plate, and that's it, just some firmware. And that was it. And the microcontroller was 30 cents. So, as soon as I realized that that one night, I knew I hit gold. I just knew it, and I knew it would work. And the next day I went into the lab, and I tried it, and it took me half an hour to write the code and test it, and it worked.

Robert J. Marks:

You said that as soon as you realized it, you knew you were going to be rich, right?

Hal Philipp:

I actually did think that. Yeah. Yeah, yeah, yeah.

Robert J. Marks:

Wow.

Hal Philipp:

Sorry. So, there were some steps in between the original sensor and that eight-pin micro version, but at that time, I already had a company in the UK, and I don't know if you want to cover why I went to the UK.

Robert J. Marks:

Yeah, well, sure. Let's do that.

Bradley Norris:

Okay. So, before we move on from this, I'm still stuck on the insight sort of moment. So, clearly... And look, there's a lot of electrical engineers in the room. They're understanding a lot of what you're saying in terms of the technical piece.

Robert J. Marks:

The technology.

Bradley Norris:

And what I hear you is you studied these things. There was a lot of input into your head about what are the specs on this chip set. You clearly understood what each of the pins was being used for, et cetera, et cetera. There's a lot of just knowledge that went into-

Hal Philipp:

Sure, I had the register model in my head, everything.

Bradley Norris:

Exactly. But then there was a different moment or a different kind of thinking that produced this insight. Can you maybe just tease out a little bit of what you think was going on when you came to that realization?

Hal Philipp:

I think there's a lot of subconscious work that goes on. If you have a problem, it's stuck in your head for days and days and weeks. Your subconscious is working on it, and just suddenly the answer just kind of pops out. And maybe the answer that pops out is wrong. But sometimes you just know when it's right. You just have that intuition that it's right.

Bradley Norris:

But in this case, the company actually argued with you. They believed what you had come up with was-

Hal Philipp:

That came later. That came much later, because I actually developed a whole business selling these chips before the company knew what I was doing.

Bradley Norris:

Oh, wow.

Hal Philipp:

And the reason they found out what I was doing was because I was selling so many of these chips, I couldn't buy the chips through distribution anymore. I had to have a direct account with the manufacturer. And at that point, they asked me what the heck I'm doing with these chips, because I'm buying reels of these chips. And I wanted them to do the programming. I wanted them to put the firmware in for me because programming that was a headache.

Bradley Norris:

So, you didn't have to flash...

Hal Philipp:

I needed to buy a big machine to do the programming and quantity and so on. So, I didn't want to do the flashing. I wanted them to do it, and I wanted to laser mark my company's logo on the top of the chip, so it looked like my company. So, it was a bit of a Potemkin village, but that's what a lot of companies do. They buy silicon. They put their own markings on top. So, that was part of the strategy or the business plan I was evolving as I was going on with this whole process. So, I called Microchip. I called the local rep from the company, and he didn't want to talk to me, so I kept escalating up the Microchip chain. Microchip is Arizona. You guys probably don't know them. And I finally got to the CEO of Microchip, Steve Sanghi, and Steve invited me to Arizona to the company, and he had meantime asked his engineers to evaluate my tech and see whether it was viable or not, and whether the scope...

Because I'm asking for a direct account. This is now a board level kind of decision, doing lots and lots of these chips. So, I got to his office, I was in his office boardroom, like this one here, and there were a bunch of his executives sitting around. I knew some of them. And Steve says to me, "We had our engineers analyze your stuff, and it doesn't work. It can't possibly work."

Robert J. Marks:

Oh, boy.

Hal Philipp:

I said, "Why?" "Well, they said... I don't know." He wasn't a technical guy. He said, "The switching arrangement, it's just not going to work. It's impossible. All the engineers that looked at this said it won't work." I said, "We're selling thousands of your chips, and it works."

Robert J. Marks:

"What's your problem?"

Hal Philipp:

And then one of the managers said, "We don't want to do this direct agreement with Mr. Philipp. We're not going to do it with him." And Steve Sanghi, to his credit, he stared them down, and he said, "Yes, we are. I think this guy has something." And he gave me a direct account.

Robert J. Marks:

Wow.

Hal Philipp:

And that changed the whole course of the company. So yeah, I mean, I had to screw up the courage to call him in the first place, but setting up that meeting was really crucial, and it had to be face-to-face. You can't do this on Zoom call. You really had to read body language. You have to really understand the subtleties of what's going on in the conversation. If you think you can run a tech company solely on Zoom calls, you will not. It's not the best or most efficient way of doing it. The best way is you fly there, you sit down, you talk, you read the body language, you see what's going on in their minds, and you see the faces of the other people in the room, which Zoom will filter out. You had to read it. You had to read the room.

And so he gave me that, and we bought tens of hundreds of thousands of these chips, ungodly quantities of these chips. I had the company in the UK at that time. It started my company in Florida, but I moved to the UK to do a joint venture. We kind of missed that part of it. So, I was in the UK, and I had an accidental company because I was supposed to be doing a joint venture with a British company to sell this technology into the European market. I was only going to be there for two years.

Robert J. Marks:

An accidental-

Hal Philipp:

Yeah, it was an accidental company.

Robert J. Marks:

Wow.

Hal Philipp:

Remember, my business model in my head was I was a sole guy selling license agreements, so making money and I can go have all the holidays I want. And in this case, this joint venture failed because the company couldn't uphold their part of the bargain. The quality was bad. They weren't putting the money into... I took the technology back. This was around 1996, '97 timeframe. And so, I had customers at that point, and it's like, "How do I support the customers on my own? I'm just a single guy operating out of a rental house in the south coast of England." So, I had to start hiring people, and that's the point of no return.

Robert J. Marks:

Why is that? Hiring people is a point no return-

Hal Philipp:

Then you have to have a corporation.

Robert J. Marks:

Oh, that's your accidental company.

Bradley Norris:

And you have responsibilities.

Hal Philipp:

And then you have to do payroll.

Robert J. Marks:

Okay, I gotcha. Gotcha.

Hal Philipp:

And you have to do corporate taxes, and that's feeding on itself. It's a virtuous circle because now that you have an employee, you're more productive, so you're selling more. So now, you have to hire more employees. Now you have to hire engineers. Now you have to hire accounting department. So, I had an accidental company. I say that with a little bit of a smile, because it wasn't truly accidental, accidental, but it had that sort of flavor about it. It was not intended. Let's put it that way. I didn't intend to start that company. I sort of fell into it, and I kind of embraced it. I thought it was a pain in the you-know-what, but I sort of went with the flow. I tried to write a business plan at some point. I tried to get venture capital at some point. This was the year 2000. I tried to get VC money. I was laughed at. I was laughed at.

Robert J. Marks:

Just to point out, you had never asked for a penny of venture capital before then.

Hal Philipp:

No, I was self-funded.

Robert J. Marks:

All of this was done on your own dime.

Hal Philipp:

Yeah, it was all self-funded. But remember, I had the revenue stream coming in from other patents. So, this gave me sort of a base level of income that I could do other things with and invest into this operation. It wasn't huge amounts of money. We're not talking even hundreds of thousands. It was 50, 60,000 a year. It's sort of minimal, but it was enough leverage, enough cash to give me some leverage to do what I needed to do for the company. And then the cash just kept coming in because the sales just went geometric, which is absolutely, what, exponential. As soon as we started selling this little eight-bit microcontroller, that was the key moment for the business at that point.

Announcer:

Thanks for joining us for part one. We'll be back next time to cover the rest of Hal's path to the modern touchscreen. Until then, be of good cheer.

This has been Mind Matters News with your host Robert J. Marks. Explore more at mindmatters.ai. That's mindmatters.ai. Mind Matters News is directed and edited by Austin Egbert. The opinions expressed on this program are solely those of the speakers. Mind Matters News is produced and copyrighted by the Walter Bradley Center for Natural & Artificial Intelligence at Discovery Institute.

