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Mark Frauenfelder: Welcome to the CoolTools Show. I'm Mark Frauenfelder, Editor in Chief of CoolTools, a website of tool recommendations written by our readers. You can find us at cool-tools.org. I'm joined by my co-host Kevin Kelly, Founder of CoolTools. Hey Kevin.

Kevin Kelly: Hey. It's great to be here.

Mark Frauenfelder: In each episode of the CoolTools show Kevin and I talk to a guest about some of his, or her favorite uncommon, and uncommonly good tools they think others should know about. Our guest today is Simone Davalos. She has had a long and storied history of aspiring to be a technological reprobate. For many years she settled for moving people to terrified delight with competitions and events involving as many different kinds of robots as possible. A move which as landed her in the Guinness Book of World Records, not once, but twice. Her careers have included, but are not limited to Dive Bar Gal Friday, Assistant Marching Band Pyrotechnician, Circus Dork, Online Used Car Part Sales, Survival Research Labs Groupie, and Unindicted Co-conspirator. She is now Projects and Tech Support Engineer at Other Machine Co, and when she is not answering your questions she enjoys placating people with cake. Hey Simone, how are you?

Simone Davalos: I am really well, Mark. How are you?

Mark Frauenfelder: I'm doing really well. Wow. What an amazing career, and string of things that you've done.

Simone Davalos: Well, I like to go where I feel I'll have the best time, so usually when I do something it's because I think it'll be a laugh, and it's served me well so far.

Mark Frauenfelder: Good for you.

Kevin Kelly: That's great.

Mark Frauenfelder: Yeah. Right off the bat, why don't you tell us about Other Machine Company, and what the Othermill is.

Simone Davalos: Okay, the Othermill is at the very top of my list for one of my cool tools, and it's not because I work with it, it's because it's really useful, and really fun. It's a tiny, tiny desktop CNC mill. You can see pictures of it, and see the [inaudible 02:00] that are working at othermachine.co, and it's a full on CNC mill. It takes G-code, but it can also import specialized vector graphic files, and .brd files from Eagle and Gerber, so if you want to prototype PCBs, you can do that really easily. You drop the file right into our software, and it does it, and you don't have to mess with learning

machining first, which is a huge hurdle for most people when they're using machine shop tools, and want to cut out things. It's also really good for crafts, it's really good for kids to learn how to make things with machines, which is really grate, and it's a subtractive cutter so you can make things. Instead of a 3-D printer which lays things out in whatever substrate, in whatever material that you want to use.

You can put a block of wood into an Othermill, you can put plastic. We do a lot of parts out of Delrin. You can do metals, you can cut anything softer then steel really, and it's really great. I'm lucky enough that my job right now is to make stuff on the mill, teach people how to make stuff on the mill, and then answer questions from people who are making stuff on the mill. It's really ace. It's really a lot of fun.

Kevin Kelly: Let's get some ... For the listeners out there. Give me an approximate size of this thing. It's bigger than a bread box kind of a thing?

Simone Davalos: It's about the size of a bread box actually.

Kevin Kelly: Okay.

Simone Davalos: You could get rid of your toaster, and comfortably fit it on your counter. It's about 10 x 10 x 12 inches high, it's got handles, it's fully enclosed so you can contain all what you call swarf, which is all the stuff that comes of the stuff that you're milling when you cut something. It's got 3 axis. You've got x, y, and z. It's got windows that snap off, and on so you can move things around from whatever direction you need them to move in. It's got touch off. It's really quite a nifty little machine, and we're working really hard on it, and we're constantly revising it to make it better.

Kevin Kelly: Again, some elementary things for people. This has a little dremel head or something. A little cutting head, so it's spinning, and it's like a laser cutter, it's a milling machine, so it's going to grind up, or cut off the material that you're starting with. Is that right?

Simone Davalos: Yes, absolutely. It can use dremel tools even. You can use anything with an 1/8th inch shank, which is the diameter of the tool that [crosstalk 04:20].

Kevin Kelly: You can use a dremel head. You can put different ones in there.

Simone Davalos: Yep.

Kevin Kelly: What is the cost?

Simone Davalos: It costs $2199, and we're shipping right now.

Kevin Kelly: Then you're saying that ... Again, for people who are maybe starting out, don't know very much about this, you mentioned a whole list that's alphabet titled, file names, but for a person who's starting out, if they use a 3-D printing program does the same one work for this, or can they take a Google Sketchup thing, or Illustrator file? What are some of the things that someone might start with?

Simone Davalos: You can take a picture. You take the graphics program of your choice. You could use Illustrator, or Inkscape, or what have you, and you can draw a picture, and save it as what's called an .svg, it's a specialized vector graphic. It's a file format that most graphic software can export, and you save it as an .svg, and then you open up Otherplan which is the software that comes with the Othermill, and it's free to download on our website to try it out. It's Mac native, which is very exciting if you're in the machining world, because not many things that are made for machining happen in Mac, and you can import the vector graphic, and it'll pop up right there on the rendered machining bed. You get a little picture of the mill, and a picture of what the bed looks like, and you can set it up to cut with whatever tool you want.

We've got a lot of built in settings so you don't have to calculate what are called the speeds, and feeds, which is how fast a tool has to turn, and how fast it travels across the material depending on what the material is, and what you're cutting. That's a speed and feed. It's really complicated. It's really easy to do this in Otherplan, because you can say, "I want to cut this out of brass with this tool," and it'll setup up the speeds, and feeds for you, and they been working pretty well so far. Yeah, you can import the Illustrator file. We use a lot of Inkscape around here. It's a free program you can download. Cut it that way. We've made stamps, we've made chocolate molds, we've made of course PCBs, and circuit boards, and custom stuff. All that kind of thing.

Mark Frauenfelder: Simone, a question about what people can expect from this. Say you're doing something that's a 3-D part like a skull. People like to make skulls on 3-D printers, and stuff. You have a block of wood, or Delrin, or something. You put it down, you cut things out to the point where you have to then rotate the cube, and set it down, right?

Simone Davalos: Mm-hmm (affirmative).

Mark Frauenfelder: I'm wondering, do you have some way to index the parts so that the tool knows where it is in relation to the stock, or the material that you've got? How does all that work?

Simone Davalos: It's mostly automatic. You can record where the tool is if you need to fixture something. We're playing around a lot with 2 [SED 07:29] machining, and 4 SED machining, and what have you. It comes with an alignment jib, so you can tell the machine that you've activated the alignment jig, and where the material is on the bed. Then as long as the machine knows where the material is, and as long as you've taken your measurements like with a dial calipers, or something, or you make sure that all the numbers match, which is harder than you think, the software does the rest. The software says, "Okay, this is where the part is. This is how you've rotated the file," and it works really nicely.

Mark Frauenfelder: That's great. It's rated at 1/1000th of an inch precision?

Simone Davalos: Yeah. Technically we can get down further then that, but 1/1000th is what we're comfy saying.

Kevin Kelly: Yeah, that's really cool. $2100. You mentioned people are making molds, and they might make stamps, what other kinds of things are people at home-ish doing with a mill like this?

Simone Davalos: People like to make presents with it. I know we like to make presents with it. A lot of people are making craft things with their kids. We had a fellow pick one up, and he sent us a really lovely photograph of their kids making their first light up PCBs, the printed circuit boards. He taught them basic electrical engineering with them sticking their LEDs to the thing that they cut out in the machine, which is really fun. There are stamps. There's a jeweler who is making really beautiful engraved jewelry, and then putting gems, and settings and things in it. We make a lot of jewelry around here obviously. Custom stationary, obviously you can make stamps for that. I'm working on an astrolabe right now to see if I can, and it's going really beautifully. I got some graphics from Alexander Rose at the Long Now Foundation. I asked him what his favorite astrolabe was, and he said, "Oh, this one," and I copied the graphics, and I'm cutting it out of brass.

Kevin Kelly: Cool. Okay. That sounds great. The price point is still a little high for I think a lot of people, but of course compared to another computer controlled milling machines it's dirt cheap. It'll certainly be something that I think a school, or ... Are they in TechShop now? Are they robust enough to be in TechShop?

Simone Davalos: Jim Newton of TechShop owns 2 of them, and we're talking to them. It's a great machine for schools, because it's a very low barrier to entry, and when you're one learning all about that machine you can take the skills that you've learned ... Say you've learned about G-code, the machine

takes G-code which is a standard machining language for bigger machines like a Haas, or another ... A Bridgeport. You can translate that, and know how to manipulate the software, and know how to cut things out on bigger things. Also, it's not a kit. It comes literally out of the box ready to go. You can hook it up in 20 minutes and have your first thing cut in under an hour, which is something it's not really possible for other CNC machines.

Mark Frauenfelder: This is so great Simone. I'm so much more personally excited about subtractive CNC than I am with 3-D printers.

Simone Davalos: Oh, yeah. 3-D printers are great, but we're really excited that we can cut things out of anything we want pretty much. We can do all kinds of things it's really great.

Kevin Kelly: You can even cut up a 3-D printed piece.

Simone Davalos: Yes. We're actually looking for really for really excellent ways to have a 3-D printer, and a mill be used in tandem. Side by side.

Kevin Kelly: Right. That is definitely a cool tool. What else do you have?

Simone Davalos: The other thing that I was thinking of is something that I realized that I use all the time. Back in my pyrotechnician for the marching band days I had a friend named Jennifer [Gethis 11:23] who went to med school. She was a couple years older than I was, and we were super great friends. When she finished med school we were having a visit, and she handed me this little thing in this little plastic pouch, and she said, "I really want you to have this. You're the only person who's going to appreciate it, and I don't envision ever needing it again for anything, but I figure you might be able to figure something out." She handed this little pouch to me. It had little snaps on it, and it folded out. It was really nice to handle. It was very old school, roll it out, and had all these little tools in it. I said, "Well, what is it?" She said, "It's my gross anatomy dissection kit," and you can get them on any medical school shop online.

They offer all kinds of different kinds. She used it to cut up her cadaver in her gross anatomy class. She sterilized everything afterwards obviously. I find myself using it all the time oddly enough for electronics. I build mostly cocktail robots when I'm not doing anything else. My personal cocktail robots that I build are really tiny, and they have lots of tiny little tubings, and tiny little fittings, and tiny little things that can snap, and plumbing, and it's fire, and it's this whole little thing. It's so hard to get in there, and connect, and disconnect everything, but I find that with my dissection kit ... I have 2 different sizes of hemostat, I have a scalpel blade, I have a couple of different kinds of forceps, ones got teeth on the end, so

it's really easy to grip stuff really tightly. It's got a probe so I can push wires out of the way. The hemostats are great for cutting off the fuel line, if I need to cut off the fuel line, or if I need to adjust piping.

I've used it on sumo robots, I've used it in a whole bunch of places, and it's really great for repairing stuff that's electronic on the fly, especially when it's smaller, and you don't have your full set of tools with you, but I have this in its little pouch. I added screw driver. A standard head, and Philips head screw driver, and it works really great. The screw driver fits right in the pouch. I can take it anywhere I go. I can tuck it in the side of the robot if I need to. If I have to repair something, bang, there it is. It's really fabulous.

Kevin Kelly: I see one here on Amazon for $14. Are they basically equivalent, or are there some brands, or varieties better? Is a cheap version okay?

Simone Davalos: A cheap version is fine as long as the tools are going to stand up. They all come with different things in them, so you really want to find out exactly what your needs are, and then go through your options, and find the one that's right for you. They're really infinitely configurable. Lots of them come with huge amounts of stuff. Some of them are the bare minimum, but you've got to find what works for you, and it's really a nice tool because you can sculpt it to your needs.

Kevin Kelly: Okay. Cool. I love it.

Mark Frauenfelder: Yeah, it sounds good. Tell us about RoboGames.

Simone Davalos: Well, RoboGames is the event that I used to run with David Calkins, and we ran it for 10 years, and we took a break last year. Now David is coming back for number 11, because as he says, "Well, you know. We have to go to 11."

Kevin Kelly: Turn it up to 11, right?

Simone Davalos: Yeah, turn it up to ll. I asked why not make 10 louder, and he stared blankly at me and said, "No, no, no. It goes to 11." It actually is the event that we are in the Guinness Book of World Records for. We're in it twice, and it is the world's largest open robot event, which means that anybody can come and compete. It's open to literally everyone. You don't have to be part of a school. You don't have to use a certain kind of kit. You don't have to be from any particular country as long as you can show up, and compete, and having a working robot, everyone's welcome. There're about 60 different events. Everything from tiny little sumo robots that push each other out of the ring, to your big standard bog, giant killer robots that shoot fire, and bang each other against the walls of the bullet

proof arena. That's always a crowd pleaser, and it's always a lot of fun. After 12 years of doing this, it's built quite an amazing, literally international community around it.

I was telling everyone in my office this morning that we are going to the wedding of a person who got his start building robots at RoboGames in 2004 when we started. He was 15 years old, and he built his first robot, caught the bug, and now he's 25, and getting married next weekend. He's got his own thriving robot business that he would not have started had he not had the support of all of the old timers, and all the young kids, and everyone who's really into robots at RoboGames. We have a year round community that people talk to each other on Facebook, there are forums, there're people in Brazil that are super excited. We always get a huge contingent of people from Mexico, and Brazil, and Indonesia. Everyone has this common thing that they all do together. It's a really beautiful community, and we're teaching lots of kids how to do things they might not understand. The first question we usually get when people hear about RoboGames, is, "Well, how do I get started building robots? I don't know." It is.

It's really hard unless you have a lot of drive, and you're really good at research, and maybe get the right books, because there are a lot of really bad robot books out there. If you get the right books, you can only go so far. It's really much more helpful when, especially when you're a young kid, that yeah, you could do the projects out of the books, and Yay, that's really great, but if you have other people who are also doing similar projects, and everyone's doing it slightly differently, and you're all facing off against each other in competition, there's really an added energy that goes with it, and its literally ... You get the bug for it. People don't give it up. You can't walk away from it. It's really hard.

Kevin Kelly: You mentioned good books, so what's one good book for beginner robot building?

Simone Davalos: My all time favorite beginner robot book is, "Robotics with the Boe-Bot," I think is the title. It's made by Parallax. Parallax.com. We have a list of resources at RoboGames.net as well, as well as all the event times, and rules, and everything. It's hands down the best written book I have ever read on how to build a robot when you've never touched a circuit before, ever. It starts with-

Kevin Kelly: "Robots with a Hoe Bot"? Is that what you said? "Robots-"

Simone Davalos: It's a boe-bot. B-O-E-B-O-T, and it's "Robotics with a Boe-Bot" from Parallax, and you can literally start on page 1 having never done anything. It teaches you how to bread board, it breaks everything down into little

contingent steps. It's a 400 page book, but it flies by. It comes with a kit as wells, so you don't have to go and scrounge for the parts, or anything. At the very end you will know how to program, you will know how linkages work, you'll know how to make a walking robot, you'll know how to make a rolling robot. You'll have an idea about how sensors go. It's all the basics. It's everything you need to know to get started, and you can extrapolate from that like crazy when you're done with it. You can start using your own materials, and your own kits, and learn about machining, and doing all that sort of thing. It's really a wonderful resource.

Kevin Kelly: It looks like a spiral bound version-

Simone Davalos: Yes, it's super old school. Yeah.

Kevin Kelly: A boe-bot, B-O-E - B-O-T, boe-bot is a ... What is a Boe-Bot?

Simone Davalos: The little robot kit that you get is built into a Boe-Bot, and it's-

Kevin Kelly: Is it from Parallax?

Simone Davalos: It is from Parallax, and we're super big fans of Parallax in my household.

Mark Frauenfelder: Does it use the basic stamp?

Simone Davalos: It does use the basic stamp. There are a couple of different versions of it, and they're all configured differently on the board, but the basic stamp is great, and then you program in the linker to the basic takes. Then you can extrapolate, and go on to robot C, or what have you. It's a lot of fun.

Kevin Kelly: Right. They have this spiral bound version of this book for $0.39 on Amazon. It shouldn't be a problem finding one. Then you need the little Boe-Bot kit. Is that right?

Simone Davalos: The kit usually ... Back in the day the kit came with the book, but you can check out Parallax. I think they probably still have it.

Mark Frauenfelder: Yeah, it's on Amazon. The Boe-Bot kit. It's $170, and it comes with the book.

Simone Davalos: Great.

Kevin Kelly: That's cool. Any there robot tools that you would recommend for someone who is new to this?

Simone Davalos: Let's see. Robot tools. Just the basics. Learning how to solder. A good soldering iron is always absolutely worth its weight in gold.

Kevin Kelly: Do you have a recommended good soldering iron?

Simone Davalos: I like the ones with the power pack where you can control the temperature, brand names escape me right now. Definitely get one where you can control the temperature, that has it's own separate power pack, not the cheapo ones from Radio Shack, or wherever that have a cord the plugs into the wall, because those are fine, but they're really hard to regulate, and you're going to fry our components if you misuse it. It's much better to have anything with a really good temperature control, and all the bells and whistles. You want the rack, and the sponge, and the place to store your solder, and maybe a solder sucker, although those are ... Solder flux is great which is what makes the solder really stick.

Kevin Kelly: You don't want to skimp on soldering tools-

Simone Davalos: No.

Kevin Kelly: ... Because it sounds like when you're doing fine electronics, it's very easy to make costly mistakes, in terms of burning stuff up.

Simone Davalos: Absolutely.

Kevin Kelly: It's worth the little extra money to get a, as you said, a good regulate soldering iron.

Simone Davalos: They run the gamut. There are some that can go for $400, or something, and there's some that are more reasonable then that. You have have to shop around a bit.

Kevin Kelly: It's not like soldering a pipe where you want a lot of heat. You want a very fine control.

Simone Davalos: Yes, you definitely want fine control. They offer different kinds of tips as well, so they have flat tips, and pointy tips. It really depends on the project that you're working on. After you've done it for a while you know what you need, and it's a really great way to explore what your skills are.

Kevin Kelly: Great.

Mark Frauenfelder: All right. It looks like we have one more recommendation from you Simone. This is the "Manual for Civilization."

Simone Davalos: Yes, something Kevin Kelly knows a little bit about I reckon. The "Manual for Civilization" was started by the Long Now Foundation, which I am proudly a member, and I used to work for. It is a really splendid, beautifully curated collection of books by thinkers, and writers, and

dreamers, and artists, and it's all about what you would do. If civilization ended what knowledge would you need to restart it? I know Kevin, you can probably talk at length about this. It's literal books, that are in a literal place in San Francisco at the headquarters of the Long Now in a place called the Interval, which is a glorious tool in and of itself, and is intended to be. It's essentially a cocktail bar where you can go and talk about long term thinking, lofty concepts, read these books. It's a really great all-in-one thing, and it's to get people to think long term. To think about not the next 5 years, or the next 10 years, but the next hundred years.

They throw events, and they talk about things like climate change, and what are your desert island books, and all of that sort of thing. It's wonderful, and it's a beautiful place. It's a really lovely place to be in. There are prototype from the clock of the Long Now there, Brian you know has his 77 million paintings playing on the back of the bar, which is 77 million [inaudible 22:50] originated paintings, which is just beautiful. It's a celebration of beauty, and thought, and it's wonderful. Also, the cocktails are sublime.

Kevin Kelly: They're not made by robots, yet.

Simone Davalos: Not yet.

Kevin Kelly: Not yet. The books in the "Manual of Civilization," I'm pretty sure that while the books are there, there's also online somewhere a list of the books if you want to see-

Simone Davalos: Yes, there definitely [crosstalk 23:17] interval website.

Kevin Kelly: ...What you should put in your doomsday bunker, or bring on to your desert island, but the idea of course is that some are very practical things of how to make a foundry and start casting aluminum, and make your mill, which then makes the drill press, and you bootstrap an entire workshop, and some are the other kind of essential civilization kind of knowledge that you'd want to have like how to make a law system, or how to make a calendar. Then some in this library are the classic cannon of both the West, and the East of saying it would be a real shame if we had civilization again, but lost all of Shakespeare. Let's keep a cannon there. I think for a lot of do it yourself, and [encotours 24:22] the more utilitarian stuff might be of interest, but you might even consider, I think, somewhere is a way for you to submit a suggestion of a book that you think if we were to restart civilization you'd really want to be sure was in the library.

If you're aware of something that maybe we'd don't know about. I'm speaking "we" here. Long Now. If you know something that the Long Now

"Manual of Civilization," should know about send a suggestion, or send it to me, or Mark, and we'll pass it on.

Mark Frauenfelder: That looks great.

Simone Davalos: Yes, indeed.

Mark Frauenfelder: Very cool. Simone I wanted to mention that one of the cool things somebody built using an Othermill is a Nerd Watch-

Simone Davalos: Yes.

Mark Frauenfelder: ... It's a little wrist watch and you press a button, and a couple of LEDs flash in binary.

Simone Davalos: Yeah, it tells it's time in binary. That was our summer intern Sam DeRose. He built that last summer, and he wrote the instructable for us, and we're getting through our back log of projects. We put that up, and it's incredibly popular, but it's a wonderful little project. It encapsulates everything. We had another ... The [inaudible 25:31] intern after him build a brass watch case which can fit over the Nerd Watch, which is really swell, which we will release later on. It goes to show you that you can do all kinds of things on the Othermill. It's really a lot of fun.

Mark Frauenfelder: This shows you the traces, the copper traces are really narrow. That's all cut out with the Othermill?

Simone Davalos: Oh, yeah. Absolutely. Surface mount traces. We can do down to really, really tiny little surface mount packages. We show you how to do it.

Mark Frauenfelder: Amazing. That is so cool. Simone, this has been lots of fun learning about all the different tools that you use-

Simone Davalos: Thank you very much.

Mark Frauenfelder: ... That's part of your very interesting life.

Simone Davalos: Yeah, it's been lots of fun talking to you guys. It's been really great. Thanks for having me

Kevin Kelly: Yeah, I think you should try ... You're so boring, and that dreary accounting job. You really should try something different.

Mark Frauenfelder: Yeah, exactly.

Simone Davalos: Yeah, I should go get out. Maybe wear bright colors, or something.

Kevin Kelly: Get a life.

Simone Davalos: Right. Maybe read more. I don't know. Thank you so much.

Kevin Kelly: I'm glad you're resurrecting the RoboGames to which was always for me ... I don't know. It's like watching flames in the campfire. Who cannot enjoy machines smashing each other? I mean really.

Simone Davalos: It's really true, and it's such a great underlying principle as well, because all the kids learning their math, and science just because they want to smash robots into each other is really inspiring.

Mark Frauenfelder: Yeah, that's the only way to learn.

Simone Davalos: Oh, man. Boy is it ever. It's super fun. I highly advise everyone to go this spring.

Kevin Kelly: Thanks again for joining us.

Simone Davalos: All right. Thank you.