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Policy Considerations & Industry Perspectives on 3D Printing

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PANEL 1: POLICY CONSIDERATIONS &
INDUSTRY PERSPECTIVES ON 3D PRINTING

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Aaron Wright: Thanks for coming out in the snow to talk about 3D printing. We're hoping everybody learns more about 3D printing and we can have a great conversation.

For the first panel, we've put together an amazing group of technologists and lawyers who work with 3D printing companies, along with some experts who deal with 3D printing on a policy level. Please introduce yourself and then we can dive into some questions.

Natalia Krasnodebska: My name's Natalia Krasnodebska. I'm the Community Manager at Shapeways, which is a New York-based 3D printing service and marketplace. We're kind of like the Kinkos for 3D printing.

If you have an idea, you upload your design, you pick one of fifty different materials, we 3D print it in our factories, and ship it to you wherever you'd like in the world. And then if you want to sell your designs, you can also open up a shop on our platform.

Michael Weinberg: I'm Michael Weinberg from Public Knowledge, up from D.C. Public Knowledge is a non-profit advocacy organization. We represent consumers in technology policy issues. We do a lot of work with online and digital copyright stuff, in addition to net neutrality-type things. But today it's all IP, all 3D printing.

Martin Galese: My name's Martin Galese. I'm general counsel of

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* General Counsel, Solidoodle LLC.
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a 3D printer manufacturer called Formlabs. We're located in the Boston area. We took a technology that was known in the industry, but cost hundreds of thousands of dollars and took up huge amounts of space. And we brought it down to something that people can buy and put on their desktop, opening it to other users.

John Knapp: My name is John Knapp. I'm the general counsel of a 3D printing manufacturer called Solidoodle, right here in Brooklyn. And we make accessible, easy-to-use 3D printers for the consumer market. We are in our fifth and sixth generation printers today, after about three years, and are innovating to bring the technology to the mass market.

Greg Boyd: My name is Greg Boyd. I am a partner at Frankfurt Kurnit and the head of our Digital Media Technology and Privacy practice. We represent a lot of technology and licensing companies in general, including in advertising and video games.

Most relevant for this panel, for a decade or more I've represented TurboSquid, who is one of the largest 3D model marketplaces in the world and would like to be one of the best sources for 3D printable models in the coming years.

Aaron Wright: We have a great panel. To set the stage, there was a really interesting May 2, 2013 report from McKinsey where they estimated that in ten years, by 2025, there's going to be four trillion dollars' worth of 3D-printed products in the marketplace. And that they thought it was going to give consumers 35–60% cost savings.

Do you think McKinsey is right? Is this the right time table? In ten years should we expect that there's going to be 3D printers in everybody's home? Or are we going to use services like Shapeways to print products instead of going to Amazon or Wal-Mart?

Natalia Krasnodebska: While I can't speak to the numbers, I do think that 3D printing is exploding. It is reaching mass levels of adoption, whether on desktop printers, or just in that the public knows about it more and more. More and more people have heard of 3D printing and wonder how it relates to them.

We've certainly seen in our own marketplace that many sectors blow up starting with jewelry, which is kind of the first place that lends itself to 3D printing. Because one of the basic things that you can do with 3D printing that's sort of revolutionary is customize it.

People have customized jewelry for centuries. Initial pendants have always been popular. Jewelers know to go back to those whenever there's a recession because they'll still sell.

And 3D printing allows you to take a template that you may have gotten on TurboSquid or that some designer's made for you and make it. So we've certainly seen that in jewelry. And we're increasingly seeing gadget accessories, iPhone cases, drone accessories, GoPro mounts, things like that. 3D printing's sort of a perfect market for one.

There's a story where a photographer realized that he never had anywhere to put his lens cap. So he 3D printed a little clip for his camera strap to clip on his lens cap. People caught onto it in his photography forums. And then he started selling it. So we're definitely seeing that happen across a lot of different sectors.

Martin Galese: There's no question in my mind that 3D printing is always going to be an absolutely massive part of the design and production tool chain. You have, and you have had for a while, designers who in their professional capacity are printing prototypes of their products. They're testing them out.

And that's, I think, come absolutely hand in hand with digital CAD. So I'm not carving prototypes of a phone, I'm prototyping it at my computer. And now I want to actually be able to touch the prototype and see if it's going to work well. That, I think, is just going to grow. I think we haven't seen the end of that. We haven't seen maybe even the middle of that.

Because now those printers are coming to everybody's desktop. And that's, I think, a big deal. And by everyone's desktop, I mean everyone who is creating this sort of content and doing this sort of design.

There is a different question that the media spends a lot of time on that I think is absolutely fascinating: consumer 3D printing. And there, for consumers, I do think it's going to be very popular. But I think it will probably always be popular for those things where people will pay a pretty substantial premium for personalization and customization.

You were giving the example of cell phone cases. I think that's absolutely right. I don't see people printing replacement parts for their dishwasher en masse, although you do see people talking about that online. But I do see them doing personalized jewelry or personalized phones and things like that.

When you had the first kind of halfway decent color printers at home, big clunky things with continuous feed paper, you had Printshop Pro and you had these tools that would let people print their own greeting cards at home. Some of you may have done that.

People don't seem to do that very much anymore. There was this wave of everybody wanting this absolutely custom Christmas card that they would print on their home color printer and wasn't that amazing. And then the "gee whiz" factor of that did drop off. So I think it'll be

6   CARDOZO ARTS & ENTERTAINMENT   [Vol. 34:1

interesting to see what consumers really want there.

John Knapp: I tend to agree with that, I think. But I think one way to think about the potential of 3D printing in the consumer market is that it's an incredible way to engage with whatever you're already passionate about.

So whatever particular hobby you would have—photography, model trains, drones, anything down the line that you already have a passion for and that you're already engaging with—3D printing gives you this incredible way to customize and to interact with that area in a way that's never been available before. I think that that alone is a massive market. And we're just seeing the inroads into that.

The question beyond that into the mainstream consumer market is driven with two points. One is the technology. Is it truly affordable? Is it truly easy to use? It continues to be, in some ways, a bit of a challenge for people to figure out how to get a printer up and running, making accurate prints. We're getting a lot better about that. The hardware issue is coming around the corner.

The second part of that, to me, has always been content. You're talking about a mass consumer market. Are you expecting people to be firing up CAD software and designing models from scratch? I don't know if that's a mainstream consumer activity; I don't know if you can expect mainstream consumers to be designing things from scratch, at least with CAD software as it exists today.

So one of the interesting and really exciting things for me is to see design software becoming more and more intuitive, allowing more and more people to engage in the 3D design to make models that can then be printable. It's tempting to think that we're going to make massive databases of lots of content.

I think that's great and that you do make a huge case for adoption by having the content there, but you lose some of the magic if you go down that road. You lose the magic of customization which 3D printing allows. So for me, one of the fascinating things to watch is how the design software itself kind of matures and becomes more accessible to mainstream.

Greg Boyd: And I would add that I think we are a long way from—though I want to get there—the [Star Trek] version of 3D printing. You know, "Earl Grey, hot." And then it just pops out in my house like a toaster.

But I really want to just echo and maybe encapsulate a little bit of what John and Martin said. I definitely see it in a B-to-B context. I definitely see it in a designer context. I just don't see it in the consumer context. I want to.

But, I had a laser printer for years and they sucked for years. And they sodomized us on the printer cartridges for years. And then I said, "I'm tired of having a laser printer." And now I print at work. Or I don't print at all. In fact, there's not a single piece of paper in my office.

So, I can't imagine a time in just ten years when you make 3D printing—though I hope I am wrong and I hope you two gentlemen make it occur—where we make 3D printing better and easier than my laser printer. And it's just going to work like magic. And just beyond that, I do hope we are at a Star Trek place for "Earl Grey, hot."

Aaron Wright: One of the printers that came out at the Consumer Electronic Show (CES)—I think it was a collaboration between MIT and Harvard—can print plastic and circuit boards or circuitry at the same time.

Obviously, over time, 3D printing software will get easier. Also, the materials are getting better and better. John, you talked about how people can use 3D printers to express their passions. Do you think that better materials will enable greater forms of personal expression?

John Knapp: Absolutely. At CES there was an incredible explosion of new materials that are available for printers. One that's been out for a while is called NinjaFlex, which is essentially the material that Crocs are made out of. It's a kind of rubberized material.

Think about the applications to cases and jewelry and so on, when you can print in that kind of material. There is all manner of carbon fiber infusions and stainless steel infusions and other sorts of infusions that give a better strength.

There's a wood particulate which I'm constantly fascinated by. You're essentially printing in particle board. It's sawdust suspended in some kind of an epoxy. So when the object is done, you can sand it and stain it and actually give it a finish that looks very much like wood.

So the materials explosion, I think, will certainly drive further adoption where you have people with some kind of niche interests that maybe a PLA and ABS don't quite meet that are better met with these other materials. I think that will only help to drive adoption.

Martin Galese: I definitely agree. I think one of the interesting things about that MIT story is that it's not just in expanded types of materials that are available, it's the ability to combine and use multiple materials at once. And that, I think, starts to make the value proposition of 3D printing even more interesting than it already is because you could start making some very functional devices.

That is, I think, still a very hard technological problem. There are a number of attempts to do multi-material 3D printing. If you have a half

million dollars, Stratasys has a machine I'm sure they'd love to sell you. I think you can do four materials at once, but limited material ranges.

I think that's an area where everybody is inventing interesting new things. And that makes the value of having some of these more exotic materials, like conductive or dissolvable materials, much, much more interesting than if you could only print one material at a time like with a color printer.

Greg Boyd: And one other thing that I'm sure is going to happen in five years is that you're going to receive something like that dishwasher replacement part and you're not going to know or care that it was 3D printed.

Natalia Krasnodebska: I think the key is that, right now, something that's 3D printed still carries some cachet. But if you have really cool looking headphones, I don't say, "Whoa, those are really awesome injection molded headphones." You care about the design.

And I think it speaks to two things. One is that—kind of like what we were talking about before—I think the consumer market, as much as I also want McKinsey to be right, is a bit overblown. But the industrial applications for 3D printing are still really underserved.

And that Stratasys machine—the multi-material 3D printing—is the Holy Grail. Whenever I do a trade show or introduce people to 3D printing they say, "Oh, so I can make an iPhone case? But can I do plastic and then metal?" I say, "Not yet, but soon."

And even when we do have that machine that works, running that machine is incredibly complicated. File format is completely beyond me. Something that we struggle with as a service provider is that we want to bring people access to the best printers in the world. And we want that printer. We want that HP printer as soon as it comes out. But we also need to teach people how to use that. And I think software getting easier and lowering that barrier to entry is the key there.

There's a lot of people who have thought that. Autodesk is giving away software to schools. The reason that coding has taken off is that it's a basic literacy that our children need to learn. I think 3D modeling is starting to get that kind of traction. That's awesome. That means that eight-year-olds know more than I do now about how to run Ultimaker.

Aaron Wright: What type of adoption is occurring? Are you getting the classic hockey stick curve in terms of user adoption and exponential growth?

Martin Galese: I think we're definitely in the hockey stick in user adoption in certain industries. If you're looking in designer industries,

or if you're making jewelry, I think we're in the hockey stick. Or if you're creating new doorknobs for a line of furniture.

I was actually talking to somebody at a trade show who was printing buttons for clothing. They were a clothing designer. And they were very comfortable making prototype clothes out of fabric. That's something they knew how to do.

But when it came to prototyping buttons, that was a huge problem. They could order a thousand from a company in China that would injection mold them for them, but they wanted four. They wanted to see how it looked.

So there, I think, we're in the hockey curve. For consumers, I think, we're pretty far from that, except for a few applications. If you class medical in the consumer, I think, actually we are in the hockey curve. You were talking about making 3D printing disappear.

The thing which immediately occurred to me is Invisalign braces. I don't know how many people know this, but for Invisalign, the enabling technology is 3D printing. The reason you can do Invisalign, which is a set of progressive small alternatives to braces, is because of 3D printing. And so there, the 3D printing is truly invisible to the consumer.

Natalia Krasnodebska: Dentists have been using it for decades. It's how we do jewelry 3D printing: using dental 3D bridges, because they are so detailed.

Michael Weinberg: That actually lends to the question of adoption and what it looks like. One of the problems with thinking about adoption right now is you're trapped in a world that is filled with things that were designed without 3D printing in mind.

So you say, "What we need is a 3D printer to replace a part of my dishwasher that was made with injection molding or whatever it was made with." And one of the things that's really exciting about the educational part of it and the design software part of it, is that what you will then start to see is a generation of designers and a cohort of designers, who are coming up and thinking of the world in a kind of 3D design way that is just fundamentally different.

You can think of an analogy: the first generation of applications for network computers had analogs to the paper world. So you have email, which is like memos and postage. And those are fine. Those are incredible technologies; we use them every day.

But if you went back in time to 1955, you could explain them to someone. You could explain them to somebody and it would make sense to them. When you got that second and third generation of designers who are building on that technology and just assuming aspects of it that would have been revolutionary to that first generation,

all of the sudden you get all sorts of bizarre applications that don't have that pre-technology analog.

And it would take you minutes, hours, days to explain the newer technology. Even something trivial like Twitter or Facebook are technologies that don't have direct pre-Internet analogs. So when you think about what you are going to do with 3D printing, the kind of uninteresting—not to cast aspersions on it—applications are things that make sense to me. But the much more interesting applications are things that it would take you 45 minutes to explain to me what was even going on. And that's what I'm really looking forward to when you think of the growth and adoption rates.

Aaron Wright: So, let's just shift gears a little bit. There's a lot of new applications that are possible with 3D printing that'll merge. But at the same time, it does seem like we're in a part of the growth cycle where 3D printing companies are entering into license agreements with existing brands and they're trying to render things in our two-dimensional world in 3D—things like toys and accessories. What does the licensing landscape look like? What's the reaction you're getting from brands? And how do you see those license-based relationships developing?

Natalia Krasnodebska: I can speak to that. Hasbro, a toy manufacturer, actually approached Shapeways last year and said, "We've noticed that you have a community of people who are making My Little Pony models."

Martin Galese: We want to sue you out of existence.

Natalia Krasnodebska: Yes. That friendship is magic. They said, "We realize there's a huge group of people who are fans, and we noticed that they're buying things made by other fans. And so we would love to enable that."

And they came to us and the team figured out a way for our community of designers to enter into a basic kind of licensing agreement with Hasbro where they can sell their designs and create new content.

And so it's kind of amazing because it's legitimizing fan art as a medium of artistic expression. A brand is getting an incredible way to engage really meaningfully with their audience. And they're making money from it, both of them.

So I think we've seen big brands say, "We've heard of 3D printing and we really want to get in on this, but we don't know how. And we're really terrified about opening up our IPs."

So I was really thrilled to actually be here today and say to all lawyers: please figure this out because it's going to be really amazing. And I can't wait to see how it goes. But we're just on the cusp. But Michael, I think you have taught me everything I know about it. So, I'd rather you open it up, please.

Michael Weinberg: That's why we both know nothing about any of this.

Greg Boyd: I think figuring it out is probably a very tall order. In my experience, business figures it out and then we run along behind and we patch up the mess. Think about when Internet law was a "thing" in 1998. And people had departments of Internet law, and then 2008 versus 2014. That was absolutely running behind the patient with bandages and Band-Aids and just getting it together. And it's got to work that way. The last thing we want is us figuring it out, for God's sake.

John Knapp: Yes. It's an interesting conversation. I think the Shapeways' deal was with particular designers, so the license was straight to the community people to do the models. Is that right?

Natalia Krasnodebska: It was with a group, so we vetted a group of designers and then those designers had their deal with Hasbro.

John Knapp: Because looking at that model, we consider whether there's a way to create the 3D content and make it available to the people that use our exchange site. But I assume Hasbro wouldn't allow us to make it available for further modification by our users.

That was the interesting conversation, because you start with: we'd love to be involved in 3D printing, we think this is a perfect synergy, we're a comic book company, you're a 3D printing company, there's a lot of overlap in the demographics, our people will love to learn about you, your people will love to learn about us, it's a no brainer. Let's make this happen.

And then we say we're going to make the content. These are the objects, these are characters that the world has only known on the page, we're going to bring them to life in the 3D models, we're going to make them available so your users can print them out and have them on their shelf, it's going to be great. And then it was suddenly okay. And then when we're done we can take them down, right? Well, not exactly.

We're making the models available, and then the users can do what they want with them. How would we stop them? We won't stop them. The idea is that you're giving your users the ability to put their

face on your models and to make them their own. There are content owners that want to get involved, but they're just learning what that really means.

If you're really going to make it available, think about how a licensing agreement is structured. There's usually an enforcement clause. Whose licensor or licensee is doing enforcement? What is enforcement? What is an infringement? What are you going into eyes wide open, that that's likely to happen? Are you comfortable with that? So, in the actual machinations of making the deal, it's a very different world.

Greg Boyd: And I think we're going to do it wrong for years. I can only speak to regular 3D models. I've had some licensors—I won't name a name specifically—like a car company that has talked to one of my clients before about the 3D models in their site where they have, say, thousands or tens of thousands of models of car type X.

And they try to enter into a license agreement that has a revenue share. Then they ask questions about enforcement. Then they have a clause in there that says, "Well, we own all the models, right?" I say, "Well, that's going to be very difficult." The revenue share is one thing to ask. But then, the ownership is the other thing to ask.

But then put yourself in the Hasbro seat or in the car company seat. It's also very hard to swallow that someone can create something that is a direct thing that you own or, at best, a derivative work of the thing that you own and that you don't own it. So it's a huge, huge tension. And then the community tension, of course.

Natalia Krasnodebska: Yes. I think what's interesting there is that there are very few original content creators in the world. I'd say da Vinci was a good one. But a lot of ideas are riffs of other ideas. And that's why something like the structure of Creative Commons is so interesting for just creativity to flourish. And why I think 3D printing has been this natural segue from people in that world to use.

Because they say, "Okay, I made an iPhone case and it's pretty cool." And then someone says, "I put wings on it, and now it flies." And now the world has something really awesome. And how they work out revenue between them is something that I would love for us to figure out the language of that and how that works.

But I think it does have a direct translation then to brands. Yes, it's terrifying if you created a beloved My Little Pony character, and actually, I think Hasbro were incredibly enlightened with this. Because they basically said, "Okay, people can do whatever they want, as long as it's not too violent, not too sexy and no saddles." That was it.

And I said, "All right. I can definitely help enforce that." That is, I

think people will work within those boundaries.

Greg Boyd: Saddles wasn't implied in the first two?

Natalia Krasnodebska: I don't know what you're talking about.

Aaron Wright: But have you seen brands push back on the appearance of STL files or other 3D design files on sites and ask to take them down? Are other brands not as enlightened as Hasbro?

Greg Boyd: You know, I'm just going to talk about models and not printing. But in the 3D model market for a decade and a million models, I've seen everything from embracing 3D models and wanting to push that out there and having community involvement to—this is one of my favorite stories—this is a story from early TurboSquid.

Does everybody know—I'm sure you do—those Coca Cola polar bears at Christmas that just warms our heart? Those were originally TurboSquid models.

Natalia Krasnodebska: Whoa.

Greg Boyd: Yes. You know, many, many years ago. I was also lucky enough that they were made by a person. Coke's ad agency licensed them and then—these are the first models. I'm sure now they have others—they have their own polar bears.

And then I was the recipient of a takedown letter from Coke. And I got to write a wonderful letter that said, "We are so glad that our licensee's experienced success with our models, but here's your invoice where you got these from us."

So really, it's everything. We want to own the models so that if we download something from you and then we later make something from it, we want to own all of that too, and all the machinations in between. It varies based on the size and on the relative enlightenment. It varies based on what I'll call the business internal political momentum associated, whether or not someone's going to focus.

Because regular BD people and regular in-house counsel are very risk-averse folks. No one gives them a medal when a deal gets done, particularly if it's a new deal. So it's going to be a long time, I think, before the car companies of the world get there.

I'm so pleasantly surprised and delighted that Hasbro is there. But I bet if we got all of Hasbro's competitors in a room and separated them in a prisoner's dilemma sense, I think the vast majority of them would screw it up.

Martin Galese: I think it is also worth noting that when Shapeways is doing a deal like that, it's a little different, I think, than a 3D printer manufacturer doing the deal because of the control over the output. So in a sense, as innovative as the Hasbro deal is, it looks a lot like any other kind of merchandising deal where a manufacturer wants to make a line of toys. They purchase the rights to make that line of toys, they make those toys, and then they provide those toys to the public for a price.

The difference here is that there's more democratic access to contributing models, and then you use 3D printers to manufacturer it, so you get some different economies in the manufacturing. Whereas, providing models to your customers that they are going to then go print is a leap of trust.

I mean, the thing that strikes me with some of the other 3D printer companies—and this is not something that Formlabs does—is if I'm a 3D printer manufacturer and then I license a beloved toy property, and I provide those models to my customers to use their 3D printers to print, what happens when somebody gets hurt?

What happens when somebody doesn't print it right? Or they do something that is inevitably going to happen at some point, and then someone gets hurt with that toy, like a child God forbid.

So there's not just, I think, this act of trust in giving me the intellectual property, as the manufacturer or as the sort of intermediary here. There's a question about how much control we're prepared to give up over the way the thing is ultimately then manufactured by our customer. Because our customer is then the manufacturer. And that's a very different model.

Michael Weinberg: This is sort of—I won't say it's looking at it—here's an alternative way to look at this in that you're kind of working through issues. Everyone is working through questions and then there are model designers and potential IP owners who have varying degrees of interests in dipping their toes in the water. Yes, if you locked them in a room, they would take their time because they're very risk averse.

And so one question is, if they are kind of left to their own devices, how do they enter this world? We actually probably won't know, because they won't be left to their own devices. These are all digital files; they're connected to printers or services that have printers that are connected to the Internet.

And so, on some level, it doesn't matter what they would prefer to do if they controlled everything. The interesting question becomes, what do they do when they begin to lose control of the models? How do they react to that? Consider transparency: I work for an organization that was

founded about fifteen years ago in response to massive overreaction by content holder-type industries—especially the music industry—to Internet disruption.

And that industry went through essentially three phases. First, they freaked out and tried to sue the Internet out of existence. Then they decided to spend a lot of money, which alienated all of their customers. They spent a lot of money trying to design very elaborate digital locks, which also alienated all their customers and didn't stop anything they were trying to stop.

And they kind of came to this third phase where they said to themselves, "Okay, people want this, maybe if we find a way to sell it to them, we can make some money." And when they got to that third phase, it turned out that people were willing to pay them money. And so now you have people starting up all sorts of innovative streaming services and what not.

And so I think what I will be looking to see is, when you are a rights holder like Hasbro and you start to see this stuff, and you have an existing business model that's very profitable, can you wake up in the morning as that rights holder, and say, "Look, we have two choices, we can defend the model as it is and as it has gotten me to the top of this company?"

And we could spend a lot of money doing that and it might work. Not everything's the music industry. Or we can engage this new technology, find a way to embrace it, maybe cannibalize ourselves in the short term, but build a longer term more sustainable option. And fundamentally that's going to be the question, if this technology is as interesting and as important as we think it is.

That's the question that these rights holders are going to face. And it's not an easy decision. If you have gotten to the top of a company because you are really good at doing something and you wake up one morning and the answer is to do something completely differently. That's easy for me, as a policy guy who works at non-profit, to say.

But the history lesson is that the companies and industries that do that come out ahead. And it's not an easy decision, but it's ultimately a profitable one. And so that's what I'm going to be looking for—not what they would prefer to do, when left to their own devices.

Greg Boyd: I'm reminded of about ten years ago, virtual property and games. And some of you guys are smiling, and you see it immediately: if you go all the way back to 2003 or 2002, and you're playing EverQuest, an MMO or something. And you want to buy some gold for EverQuest. It was a question, you know, is it cheating? Is it gambling? How's it going to work? How do we control it? How does it affect the game?

And if you would like to see me very thin with all of my hair, you can YouTube me and I'm talking about this and shaking my fist and saying, we're going to sort this out in about ten years. And exactly what I talked about before—the Internet—is what ended up happening.

Business took over and sorted it out and then law's coming around behind it. And no one thinks twice now about buying a virtual currency inside of a mobile game or an iOS game. And now we know it isn't necessarily cheating, it is not necessarily gambling. And that's fine. But it took a decade to get there. And it was driven by consumer demand.

And I know I keep coming back to that first question, but maybe that's where we're going to be in ten years: sorting out a lot of these basic legal issues.

Aaron Wright: But sorting out the music industry was a painful process. Now we're dealing with a technology that can impact an entire range of industries, as materials expand and as prices get cheaper.

The question that I keep turning back to is, in the next wave, are we going to see the Toy Industry Association of America, the TIAA, instead of the Recording Industry of America, the RIAA, bring actions to protect their distribution channels? Are we going to see jewelry companies band together to try to protect their profitable pendants?

Is that the world that we're entering into? Or, are we going to enter into a world where people band together and form some sort of centralized licensing services, like Netflix where you can, you know, just download licensed 3D printing files?

Martin Galese: I think there's one important distinction—there's probably many more-—that I want to draw, which is: if you're the music industry, someone's computer with a CD burner is an absolute gun to your head. Because it has every tool on it that you need to take the CD, rip the CD, encode the CD, and then make another exactly like it. Or to send it over the Internet if you want.

We're talking a lot today about 3D printers. When I sell a 3D printer to a customer, they could print something that infringes, if they make the model themselves, or if they find a model from someone else. But they don't have the other half of that which is, I guess, the 3D scanner side of the equation.

So the closest analogy to 3D printers when you think about this is Xerox. Think about whether I'm selling a machine that makes copies. Do I then have liability? But when I'm making something with a 3D printer, I'm not actually selling something that makes copies. There has to be something else that makes that. And so that gives me some comfort.

That whole physical copy, that's some distance away. If we get to

a place though—and I think we are getting to this place—where consumers have both technologies, then they have the way to get the model that they want and they have a way of duplicating it. You get to a place where everything really is available online, where you don't have to worry about scanning or bringing it in because somebody else has already done that, whether it's from a licensing deal or whether it's somebody who did have a scanner. Then I think that someone is going to want to start trying to go after the manufacturers. It really hasn't happened yet.

The Shapeways of the world, I think, are sort of the lightning rod for that. I don't know of any manufacturer, who a content holder has gone after and said, "Hey, customers of yours are copying my stuff and it's your fault." I feel like we fought that war with the VCR. We fought that war with the Xerox. That is not, I think, going to be repeated. But that's maybe just optimistic thinking.

Natalia Krasnodebska: I think it goes back to what Michael was saying he would like to see. I recently read Cory Doctorow's book, *Information Doesn't Want to be Free*. And in that, his main point is that it is quite ideological, for sure. And again, as a policy maker rather than as someone whose entire job at Shapeways is to make sure our community of content creators has the freedom to continue doing whatever they want.

But he said that a good copyright system is one that encourages diversity. And it seems like most of the laws that we make go the opposite way. So that's why earlier when I said "I'm glad you're all here, can you please work this out," that's what I meant.

So can we, when you're running after us and bleating everywhere, quick fix it? Or we work together to figure out how to just skip the suing and the direct rights management and go straight to iTunes. Come on.

Greg Boyd: I'm not so sure I want iTunes.

John Knapp: User agreement?

Natalia Krasnodebska: I have not, but suddenly there's a YouTube album on my phone. I'm here looking for answers just as much as you are.

Martin Galese: It is interesting. I'm not sure anyone cared about copyright law very much before people started making copies of music. There was this thing that copyright law was something publishers cared about. If you were general counsel for a publisher, you might get very

worked up about it. But it's certainly not something that would be a consumer issue.

I don't think people really thought of it that way until you started having this proliferation of copying technology where all of a sudden that happened. I think we're going to see the same thing with patent law and trademark law.

I don't think ten years ago, maybe twenty years ago, a consumer—somebody who isn't a businessperson or anything—would ever worry about infringing a patent. It would be hard for you to do in most cases. And if you did, it would be more or less economically meaningless.

But, much like the digital computer for copyright, 3D printers may be that watershed for patents. And then to a certain extent, obviously for trademark as well, all of a sudden, now I buy a printer, I put it on my desktop and I'm a patent infringer.

And there's a lot of me, and now we are a big problem, but now we also are a big voice that's trying to find a different kind of solution.

John Knapp: I think you could see something like the DMCA-type regime, or takedown regime, we were talking before about. I think a lot of people that are hosting 3D content are acting as if the DMCA covers trademark and trade secret and patent.

And they're doing everything that they could to bring them into compliance with the DMCA. And hoping that if eventually there's a test case, the judge will agree. But it's just not the law. We're hoping that there's some pretty bad cases, like the CafePress case and some other cases, even Tiffany. I wonder how that's all going to shake out.

And I think that there probably will need to be legislative solution, probably only after some really bad case law. But we'll eventually get there.

I guess one of the concerns I always have is that we not overreact and we really be very specific about what it is about this technology or technological innovation generally that needs to be addressed. There was a law firm "have you thought about this" type of alert that I picked up, which was, you know, horrible news from your law firm. Actually, they're your associates.

Michael Weinberg: Are you sleeping throughout the night?

John Knapp: Making up his firm service hours or whatever it is. But it was asking if something 3D printed was compatible with Legos. Is that a trademark issue?

Well, we did "compatible with" cases. There are auto parts cases in the '70s. There's a difference between calling yourself hyundaiautoparts.com or having Joe's Auto Parts and then stating as

nominative fair use, yes, it's compatible with Hyundai. I think that's fine.

You just can't brand yourself or hold yourself out as an official supplier of Hyundai parts. So, we know how to navigate that. If that becomes the issue with 3D printing, we can navigate that. And it's a knee-jerk reaction to think of everything that's coming up in the 3D context as something nobody has thought about before.

So I would counsel a little patience as you're looking through the parade of horribles of what's to come. We have a lot of law. We have a lot of history dealing with these issues and trademark and patent and copyright. Let's not overreact. Let's make sure that whatever legislation we do enact is targeted.

Greg Boyd: I'm comfortable that "compatible with" is a trademark work-around. But then, as I understand it, in the '80s and '90s as the car companies got a little smarter and for all their major components, they also filed design patent protection.

And those are shorter than utility patents. But still, part of you curses. So I'm not sure we know how to sort that. Maybe I just think we need to drink more and think about it. I'm also not sure what the right answer is.

Because auto engineering is very sophisticated and important, and hundreds if not thousands of people put a lot of hours into how that sprocket looks. And make it work. And I feel like they should be able to charge me—again, curse—five hundred dollars for the sprocket rather than have me 3D print it for thirty dollars, at least for a while.

And I think we should probably think about how long "a while" is. And I also think there should be some de minimis element. Like, if I'm just printing it for myself at home, I don't think I'm going to get to be a target of a case. But if I'm printing a thousand of them for AutoZone, that strikes me as a different question too.

John Knapp: If there's a design patent in place?

Greg Boyd: If there's a design patent in place and it's in force, and you infringe, I don't think "compatible with" jumps that hurdle. I think it jumps the trademark hurdle.

John Knapp: Wasn't there a Bugaboo strollers demand letter? Do I remember that?

Natalia Krasnodebska: That was my colleague, Duane actually. He broke his Bugaboo stroller and he saw that the replacement part was two hundred and fifty dollars because it's Bugaboo. And he 3D printed

it in steel. And then he put up the file for free for anyone else to print.

Hopefully, we have never received a letter from them about that. But he printed it for himself and he thought it was a good use of 3D printing. I don't know that anybody spent design hours on that.

Greg Boyd: The other thing that strikes me as nuts, now that I think about it: two weekends ago, I was in a blacksmith workshop and I was banging out some metal. Why not? But I think that, had I forged that part for the Bugaboo stroller, we wouldn't even talk about it except to say, "Boy, Greg, is a weirdo, forging the part for his Bugaboo stroller."

Natalia Krasnodebska: Duane is a weirdo for 3D printing it. What tools do you have available?

Greg Boyd: It's only cool because he printed it.

Natalia Krasnodebska: Right. Because it's a hot new tool.

Martin Galese: I think there's a good reason for that though. I totally agree with John: to rip off a paper title, I don't think we need the law of the 3D printed horse here. I think we can deal with a lot of these issues with the existing law. But there is something different, and your blacksmithing example brings it up. How long did it take you to learn how to do even that kind of blacksmithing?

Most of the techniques of creation of physical objects are things that require a fair amount of skill. I could whittle something out of a piece of plastic, if I knew how to whittle. I don't. And I'm not going to learn. I don't have time. And if I wanted to tell you how to make this thing, then I have to show you how, and we'd have to go through some barriers there.

With 3D printing—and maybe it's not 3D printing specifically, maybe it's digital manufacturing at large—none of that is required. Now in order for you to make something, all you need is access to the file that describes it and the equipment. That's it. It opens the door. And obviously, the equipment does require technical skill to use. We haven't got it perfect, but we're getting there.

There's a lot of money and a lot of people trying to make these things absolutely foolproof. And I think that is the place where the law maybe will have to change, once you have this incredibly easy way of making things, not just by 3D printing.

If you want to shift gears entirely, you could talk about people who do bio-hacking, where they're doing DNA work. Instead of requiring all this very expensive equipment, there's a general purpose digital device.

You put the file in one side and DNA comes out the other. Like a 3D printer, you put the file in one side and a My Little Pony comes out the other. You combine the two and then you get a really weird thing.

I do think that is different. I think that is different than what's come before because of how easy it makes creation and how democratic it makes creation, both good and bad.

Michael Weinberg: This is that smart cow problem, right? Like you were saying earlier, you sell a machine that makes stuff, but you still need a machine that kind of gets it in, so that's a barrier. But the smart cow problem is that if you have a bunch of cows in a pen, not all of them need to be smart enough to get out. Just one of them gets out and they all follow it. It's the same sort of thing.

It's not that everyone needs the ability to model the stuff. I don't need to be able to model that Bugaboo thing because Duane's my smart cow and he took care of it for me and he put it up on the Internet. And then it's free. And so I think you're right. The difference between the blacksmith and the 3D printer isn't necessarily the skill required to make it. It's that when you made it, the ability to do that stops at you.

It's not scalable in any way. If you model it and then put it out in the world, it scales infinitely. And I think that's sort of the fundamental difference that policy makers will have to deal with in the next ten years.

Aaron Wright: When the marginal cost goes down to effectively zero, how do you deal with the lack of scarcity? That is something that we're going to need to try to figure out. Before we go into those policy issues, there is one other aspect of intellectual property that I do think has particular a hold on the 3D printing industry.

This is a pretty old technology. 3D printing technology has been around since the late '70s or early 1980s and there's a number of patents that are controlled by several large companies.

How is that impacting your businesses, and do you think patents have prevented adoption? As patent protections expire, over the next several years, do you think that will increase the types of home or industrial 3D printers that we may see hit the market?

Martin Galese: So if any of you have ever heard of Formlabs? Define successful. We're here. So the technology that our printer uses is one of these older technologies that you're talking about. And the company that created it is still around, a company called 3D Systems. And you do have this thing where patents expire and then you're able to enter the market in different ways.

I can't go into the specifics of that, but I will say one thing I think

that characterizes this, and I think it's where a lot of the problems are coming from. I don't know of many examples where you have an industry that you can really point to and say, "This industry is being revitalized by expiring patents."

In the pharmaceutical space you've had this steady stream of expiring patents all the time. And obviously, you have generics that come on the market. And there's plenty of examples like that where there are specific things where you say, "Hey, that's a really cool way to build a gas pedal. I'd like to do it. Ten years from now, maybe I'll do it that way." That is, I think, a pretty small scale.

With 3D printing, I think, what you have is a technology that was out very early. You can watch a Good Morning America clip from 1985 or so, with one of the inventors of some of the early 3D printing technologies—a guy names Chuck Hull—talking about it. And it's the same breathless conversation that you could imagine on today when you saw a 3D printer on Good Morning America.

But after that, frankly, the industry became stagnant. There was not a lot of development. Industrial uses grew. But the kinds of customers, the kinds of people who were approaching it, have now changed.

The technology that makes the 3D printer available today at a very low price point is not radically different from the technology that was available ten, fifteen years ago, with the possible exception of the microprocessor. That obviously has reduced costs dramatically. But what held that up is patents. I don't think there's much argument about that.

And then once those patents started expiring, you had a whole industry that was being revitalized, almost overnight. If you look at the expiration of some of the patents on FDM, which is the technology that MakerBot and then Solidoodle and other companies have used, the number of companies that are doing that has just exploded.

Look at stereolithography, which is the technology my company uses. When the patents on stereolithography started expiring, stereolithography exploded. And then there's other 3D printing technologies that aren't as familiar that are still under patent and will be under patent for a long time, like some of the multi-material techniques that we were talking about. Those are much newer.

But those early patents expiring, I think, has been absolutely tremendous in causing the industry to expand hugely. That means, I think, that the legal stakes—what it means for expiring patents to enter into the public domain—have suddenly become important to people in a way that I don't think it was before, generally.

There's this idea that every time the copyright's about to lapse on Mickey Mouse, the copyright gets extended because it would be so

tremendously impactful for that to happen. The patents didn't get extended. We had a fixed term and it's done.

But the ambiguities sometimes cause a lot of friction. My company and others have faced that, where you have a very complicated question: can I do this? It's never a clear cut answer. It's always a "depends" kind of answer, when you really are looking at it. Because of the way the patent laws work.

And I think the consequences of that are just very stark here because of how much the industry is being revitalized by those patents expiring.

Natalia Krasnodebska: Yes.

Greg Boyd: Yes, 100%.

Natalia Krasnodebska: The only thing I would add as an example of that, is that in those twenty-five years, like the extrusion printers, FDM machines was one type of plastic. And now, as you were describing earlier, we have NinjaFlex. We have wood. We have bronze. That has happened in the last five years. And all these subsidiary industries, are also revitalized. There's not just fifty different types of machines, there's also 700 types of filament.

Martin Galese: Yes.

Natalia Krasnodebska: So that is the material innovation that comes along with machine innovation.

John Knapp: And the cost and functionality of the technology has improved.

Natalia Krasnodebska: Yes.

John Knapp: Just suddenly having a massive pool of really smart people that want to work on this all day as a hobby and improve the accuracy and calibration and resolution, and across the board improvements. And smarter ways to engineer it and bring the cost down. That would never have happened under patent.

Greg Boyd: And one other thing is that you're never in the clear on patents. Meaning, there are roughly eight million patents in the United States.

Four million of them are in force. It's not searchable in the way that a trademark is searchable. Four million of them in force, at the end

of the patent, they have roughly twenty claims. Roughly you can have as many as you want, but they have roughly twenty claims on average. They have more than a hundred words in a claim.

I'm a recovering patent attorney. I was a patent attorney for many years and I still play one from time to time. So it's really hard to say this technology's in the clear. It's what you said: it's almost always "this depends." And it's almost always making risk assessments.

If anyone thinks that the people coming out with the new materials and the new ways of printing are not filing their own patents today, maybe even people on this very panel, I think you have another thing coming. Because people would like to enjoy those monopoly rights for a period.

John Knapp: Or at least have a good defense.

Greg Boyd: Right. And to use them defensively, or to use them in a counterclaim. Even a rejected patent is fascinating. And this is way down in the weeds, and I apologize if nobody's this much into patents.

If you have a rejected patent due to prior art based on your current technology, then you have evidence, as blessed by the USPTO, that you're practicing the prior art.

Martin Galese: I certainly don't mean to suggest that patent protection isn't important in these contexts. We put a tremendous number of resources into coming up with interesting new developments. I think many companies do that, and there's a huge debate about how incentivizing that works. How expensive it is versus the gain we get.

I don't mean to question that. Or I certainly don't mean to get into it. Maybe I would question it in a different panel. The point I'm making is that the whole bargain on which patent protection is premised is this idea that you get your X number of years. Which for many of these patents is not twenty. That's something that people often get a little confused about. Many of these patents are from a time period where the actual effective term of protection is hard to determine and much longer than twenty years because of the way the patent rules work.

But once those patents expire, that's where I think we're getting this interesting thing of public domain. This is exciting, this is new. And I don't know of other industries that have really grappled with, all of a sudden, stuff coming to the public domain that I can use in this way.

Aaron Wright: Martin, you used a great word there: "friction." There seems to be a lot of friction generated by patents. And, there seems to be a lot of friction and lack of clarity in terms of how users can interact with 3D printing technology. I think people, not just lawyers

and people in law schools, are sensitive to this.

For example, the White House has spent a significant amount of time trying to expand 3D printing in the United States in order to make it a centerpiece of our economy.

Let's say you were president for the day and you could control Congress. What types of reforms would you like to see to lower the friction surrounding 3D printing, so that you can build your business, and this type of technology can achieve faster growth?

Michael Weinberg: As the policy person.

John Knapp: Yes.

Michael Weinberg: I don't have a business to build. I think there's been a lot done. I mean, a lot of the stuff the White House is doing is through America Makes and they're just putting a lot of money into developing new technologies, which I think is incredibly helpful.

I think one of the underappreciated impacts of the expiration of patents, and then the kind of Cambrian explosion of desktop printers, was there were people who were working on this technology in industry who were in a sort of professional back waters. They were ignored by their higher ups, who all of a sudden got attention.

I was talking to somebody who was working at Lockheed and he had been working on this stuff for fifteen years and no one had ever paid attention to him in his lab. And three or four years ago, he became the bell of the ball because the CEO came down and said, "What do we have on this?"

So, the things the White House is doing to build that are great. And they're building it both on the "America makes" side, and they have people in the White House who are very focused on this sort of maker community and thinking about these desktop printers.

So the easy answer from Washington is "Yes, let's shoot some money at it and it'll be good and things will happen."

Thinking about developing educational curricula, I think, is really important. Because, as you were saying earlier, when you get kids exposed to this they start taking it in unexpected directions because they internalize it very quickly.

And then on the IP side, yes. And I think it is definitely worth thinking about DMPA and DMTA safe harbors, if one of the theories that drove the DMCA was that Internet companies operating at scale would service third parties. And we wanted those platforms to exist without the platform having to be completely engaged with every single person they're doing business with. That logic also probably extends to hosting patented things and hosting trademark things.

There's a lot to be said with DMCA regarding how it has done or not done right, but I think that what you see is—and we've mentioned this before—both platforms and rights holders are kind of pretending that the DMCA applies to patents and trademarks sometimes.

I won't name names. I've seen multiple examples of multiple platforms of DMCA-styled takedown notices for patented things. And that system seems to be working reasonably well. So seeing an expansion of that, and then going to the liability stuff, is insane. That calls into question a century of enterprise liability theory, and so, that's a bigger nut to crack probably.

John Knapp: I agree on all the IP stuff. I think education actually would be the thing I would love to see the government really help with. We've done some pilot programs. We've gotten really good responses. And I think there's just a tremendous spectrum of applications.

We did some with lower income schools in the cities where kids would graduate without having ever had a hands-on science laboratory. There's no budget for Bunsen burners and elaborate science labs, you know.

But you can bring in a couple of 3D printers and you have got a design curriculum, and they can learn the basics of geometry and design and the physics principals and print something out and see it materialize. So we had really good response with those sorts of programs.

But, kind of going up the curve, you've got really sophisticated curriculum that people can design where you're not only learning 3D printing, you're also using 3D printing to learn your physics class, your CAD class, your design class, your chemistry, your coding. There's so much technology packed into it. It's a beautiful tool for education in so many ways.

I'd love to see the government's involvement on curriculum development, and there are some great non-profits out there that are working on it. But if I had to pick an initiative for the government to get more involved, it would be on that front for sure.

Martin Galese: I think my king for the day powers would probably be some immigration reform, particularly for high-tech jobs.

One thing that is, with your exception, not well-reflected on the panel, is just how international 3D printing is. There are major 3D printing research centers in the UK, in Italy, in Germany, in Japan.

Natalia Krasnodebska: Australia.

Martin Galese: Many, many other countries. And I think current

immigration policy makes it extraordinarily difficult for American companies to effectively take advantage of that to get those people.

Because there's not a lot of people who know about 3D printing. If I want to go find somebody who has prior experience in 3D printing, it's a small pool. And the best people are sometimes in the United States and sometimes not. And if we can bring them here, then the best people start being here, which would be of incredible value.

We're located in Boston, outside of Cambridge. We have a few engineers who graduate from—it's a little school—MIT. Many of them, many of them, cannot work for us because there's no way to get them a visa after a certain period of time. And they have to go back to their home country. They don't want to.

We've spent a great deal of time training them. We, the company, have spent a great deal of time training them, and can't keep them. If I were king for a day, I'd keep them. And keep that 3D-printed talent in a place where it's going to really concentrate it and do a lot of good.

Natalia Krasnodebska: I'm sure every other country wants that too.

Martin Galese: I think the problem is that every other country does it. If I wanted to go to another country with 3D printing expertise, they would be pretty welcome to have me. They'd be pretty open arms. I think it is a real competitive disadvantage.

Aaron Wright: I think we have covered a number of topics. I don't know if anybody in the audience has any questions, but hopefully, the panel can indulge.

Martin Galese: I think I mentioned 3D scanning at one point. We are very focused, I think, on 3D printing because all of us here—most of us here—are involved in 3D printing, but not necessarily 3D scanning. I don't believe Solidoodle has 3D scanning. We don't either. There are a few 3D printing companies that do both. So 3D Systems does both. MakerBot does both. I don't know if their product's even still on the market though, honestly. They did both, briefly. But there really is this divide between 3D scanning and 3D printing.

Part of the reason is that people seem to expect that it works like a photocopier where you do a 3D scan and then you just immediately take that file and print it. Maybe one day. We're nowhere close to that now. The output of a 3D scanner typically requires hours of relatively sophisticated manipulation to get it printable.

The day of "I'll scan this and then I'll print something that looks like this," that's not today. That's not this year. That may not be five

years from now. Maybe I'm wrong, but certainly not today.

Michael Weinberg: Can I tell you a story about 3D scanning stupidity? So there's this college in Sioux Falls, South Dakota called Augustana College. And they, along with the city of Sioux Falls, co-own a cast of Michelangelo's. They have a cast of both the Moses and the David, but this is a Moses story.

So it's on the public campus. This is a cast of a sculpture that is five hundred years old. And somebody who wanted to learn how to do 3D scanning with 2D photography went to the campus and started taking a bunch of pictures. And then was basically tracking his learning online to show people how he was learning how to do this and practicing. This is a good thing. He was sharing it with the world.

And he actually got a call from the college telling him that they were very concerned that he was violating a copyright or a patent or a trademark, and so would he please take down his scans of this 500 year old sculpture.

And he did, because he is not a lawyer and when someone calls him up and accuses him of even vague copyright infringement, he didn't feel like dealing with that. And that story got out and there was a bunch of coverage of it last week. And then the college, when they were put on the spot, didn't say, "Oh, I'm sorry, that was a really stupid thing that we did. We'll back off."

They still couldn't articulate an intellectual property right that he had violated. But what really annoyed them was that he didn't first get permission from the college and the city and the family that had originally donated the cast copy of the sculpture. Which is insane, go take a long walk.

And so the point of this is that people go kind of crazy around 3D scanning. If you go on the Internet you can find an unlimited numbers of 2D pictures of this sculpture, which is fine because it is in the public domain, it's five hundred years old. But when people go to 3D scanning, it gets people get kind of weird.

And you've seen this fight happen internally, although in a slightly more sophisticated way, inside museums. A decade ago, museums had massive internal fights about putting high quality 2D images up of their 2D stuff that's in the public domain, their older stuff. And they kind of worked through that to greater and lesser degrees and they are now in the process of internally deciding whether or not they're going to scan the stuff.

If they scan the stuff, they're going to put it up online. If they're going to let people scan the stuff, which again, we're not at the place today, but there are probably plenty of great works of art in museums right now that there are enough pictures up online that you could stitch

together a not bad model. And, people just kind of go through the looking glass when you're talking about 3D scanning. I don't understand why.

Martin Galese: Actually, I have gone to the Metropolitan Museum of Art and I have stepped and taken like, 600 photos around and then create a model and then make it and download it.

Michael Weinberg: They're great.

Natalia Krasnodebska: Encouraged it, the Smithsonian as well.

Michael Weinberg: The Met's doing a great job, the Smithsonian, The Artist Shoot in Chicago, there are museums that are doing amazing work with it. But there are other museums with people inside who want to do amazing work with it, but they haven't quite dealt with it emotionally.

Natalia Krasnodebska: I think if the people inside the museums who allow school children to come in and sit down and sketch the old masters . . . it's like this is the same thing, except our tools are different now. We use computers and 3D printers and not paper and pencil.

I was a goldsmith before I got into 3D printing and I rallied against my goldsmithing instructor about learning 3D modeling and 3D printing and he said, "No way. You will forget how to use the tools of our trade. And if we allow this into the program, nobody will take goldsmithing anymore."

And, of course, he was wrong because it's just a tool and now it's an elective, and when you first hear about it, you say, "This is going to destroy everything." And then, you say, "Actually, it will help us create more things."

Greg Boyd: But we don't use slide rules anymore.

John Knapp: It's a calculator to math.

Natalia Krasnodebska: But do you miss it because it was beautiful or accurate?

Greg Boyd: I don't. I don't miss it. But let us not pretend this is not going to result in the destruction of many things.

Natalia Krasnodebska: But it will create more. And my argument there was that the goldsmiths still need training in how to make jewelry

for the body. Just because you have a 3D printer, doesn't mean you know how to use it to make jewelry for the body. You still need to learn that.

And I think that's why 3D printing in the hands of designers is the greatest place we could put it. And the greatest place where we're going to see for example, Nervous System's Kinematic Dress, which is a dress with living hinges that folds itself up to fit in the printer and pull it out and put it on. That is mind-blowingly awesome.

And the people making that stuff and who say that this is the Twitter of the Internet that I can't explain? That's who we need to keep supporting.

Aaron Wright: Does anybody else have a question?

Audience Member: [inaudible question]

Greg Boyd: Yes.

Natalia Krasnodebska: I feel like I don't want to answer that, because then you'll do it.

John Knapp: That's the entire list right.

Natalia Krasnodebska: All that.

Greg Boyd: And you could add litigation to that too.

Martin Galese: Yes. I think there is amazing asymmetry in litigation against small players. And so many people in this field are small players, kickstarters, creating these printers. And people who are just putting stuff online just because it's interesting, like the student who was doing the scanning. And just a few well-placed takedown letters and a few scary esquires at the end could have a shockingly effective impact. Now, that's never going to deter people who have money and resources behind them. But it's hard to get money and resources behind you. That stuff's not free. And so, yes, you can use all these sophisticated tools, but never underestimate the damage that just filing a baseless lawsuit can do.

Greg Boyd: If I wanted to be anybody though, I'd want to have the content. If I could just be anyone. I mean, I love you guys, and more now than two hours ago, but at the end of the day, you're fighting and both of you may survive or it may end up being VHS versus Beta and I see that you do very, very different things.

But the person who gets to be Netflix, the person that gets to be iTunes, does not care who won the Blu-ray war and no one does. So, it's not quite a pain point, but if I could snap my fingers and just own something, I'd want to own content distribution independent of platform.

John Knapp: Content's king.