2015 AELJ SPRING SYMPOSIUM

3D PRINTING AND BEYOND: EMERGING INTELLECTUAL PROPERTY ISSUES WITH 3D PRINTING AND ADDITIVE MANUFACTURING♦

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INTRODUCTIONS

DEAN MATTHEW DILLER*

Matthew Diller: Good afternoon, everyone. My name is Matthew Diller, and I am the Dean of the Benjamin N. Cardozo School of Law. I want to welcome you to this afternoon's program, and I want to thank you for attending the *Cardozo Arts and Entertainment Law Journal*'s Symposium on 3D Printing.

Let me just say a word about the Journal. The Journal is one of the gems of our school. We have a long and deep history in the field of intellectual property which started on the arts and entertainment side, and now has grown and expanded to encompass not only all aspects of intellectual property, but related fields such as law and technology, Internet law, and the list goes on and on.

This program is great because it brings together some of those traditional creative sides of IP that are at the heart of the *Arts and*

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Entertainment Law Journal, as well as new frontiers in technology. So I know you're in store for a great afternoon and evening.

One of the things we really focus on here at Cardozo is the intersection of law and technology. We've had a full day of programming, of different programs relating to law and technology, of which this is the capstone. So, thank you.

I want to thank Professors Aaron Wright and Felix Wu for helping to put together this afternoon's program and conceptualizing this event. I want to thank the law firm of Frankfurt Kurnit for its support. And I want to thank Abby Reich, the Symposium Editor, and Elise Michael, the Managing Editor of the Journal, and the rest of the Journal editorial board and staff for putting together today's program.

At this point, I'm going to turn the podium over to Professor Aaron Wright, who will moderate and introduce the first panel. Thank you so much for coming and joining us.

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

GREG BOYD*

MARTIN GALESE*

JOHN KNAPP*

NATALIA KRASNODEBSKA*

MICHAEL WEINBERG*

AARON WRIGHT (MODERATOR)*

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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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

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.

PANEL 2: LIABILITY ISSUES AND 3D PRINTING

MARK BARTHOLOMEW*

GIANNI P. SERVODIDIO*

KATHERINE STRANDBURG*

FELIX WU (MODERATOR)*

Felix Wu: We'll now go ahead and get started with our next panel. My name is Felix Wu. I'm a professor here in our IP and Information Law Program. And I have the pleasure of moderating our next panel, which will follow quite nicely the previous one, where we started by looking at industry perspectives on 3D printing.

Now we're going to turn a bit more closely to some of the liability issues that are being raised. Natalia offered up the challenge of, "Go out there and solve our problems." I don't know that we're going to be able to solve all the world's 3D printing problems, but at least perhaps we can see where some of the pitfalls might be in terms of where liability for 3D printing might go.

So, we've got three panelists here today. First, on the far right, Gianni Servodidio, who's a partner at Jenner & Block, in their Content, Media and Entertainment and Trademark, Advertising and Unfair Competition practices. He's focused primarily on a variety of copyright and trademark issues, particularly in new media and Internet areas, as well as in 3D printing specifically, in a way that I think will be quite interesting to be able to draw from.

Next we have Mark Bartholomew, who's a professor at the University of Buffalo School of Law. Mark is an expert particularly in issues of secondary liability and also in issues at the intersection of Internet law and IP.

And finally, we have Kathy Strandburg, who's the Alfred Engelberg Professor of Law at NYU. Kathy has written in many areas that touch on technology one way or another, both with respect to questions of innovation and innovation policy, as well as with respect to questions of privacy and privacy law and regulation and the like, and written extensively in both of these areas in ways that I think will create a lot of insight into the questions around 3D printing, as well.

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* Professor of Law & Faculty Director, Cardozo Data Law Initiative, Benjamin N. Cardozo School of Law.

We'll run this panel slightly differently from the last one. Each one of the panelists will give a short presentation, and talk particularly about an area of law or a type of liability that might be raised by 3D printing. I will then ask some questions to try to explore some of these areas further and then we'll open up to questions from the audience.

So first, Gianni.

Gianni Servodidio: Thanks, everyone. I want to compliment the last panel. I thought it was really an excellent discussion of the unique issues facing 3D printing, and I thought you guys really have a great grasp of some of the legal issues that we're going to talk about a little bit more.

So I want to start by talking about copyright law. And I think a comment was made on the last panel that, you know, who cared about copyright law before the MP3 file, or before music became digitized. And I think in some ways there's some accuracy to that.

Copyright law really became a more critical tool for intellectual property owners in the digital age, when files became digital and capable of endless viral distribution over the Internet. And it became more of a critical focus.

And it's really been fascinating to see the way the law has grappled with it. Because there's competing concerns. There's desire to protect copyright law and innovation and creativity. And then there's also a palpable desire by courts not to stifle innovation. The economy of the Internet is critical for this country.

And we've seen courts really take that into account as they're trying to fashion legal rules that balance these competing interests. So you can start with the Sony Betamax case. There, there was absolutely a rule crafted to protect the substantial non-infringing uses of that device, even though there may have been some knowledge by the manufacturer that it was capable of infringing purposes.

A doctrine developed that said, if there's substantial non-infringing uses, there's not going to be an imposition of secondary liability. You fast-forward a decade to the Grokster case, involving the distribution of peer-to-peer software that was really primarily used to copy copyrighted music files.

There the Supreme Court articulated another rule that said if you do something, if you distribute a product with an intent to foster copyright infringement, you're going to be held liable for the consequences of your actions. So those are kind of the pillars of the decisions. And there's a lot of gray area in between. And it's too ambitious today for me to cover all of digital copyright law. So let's focus a little bit on how it relates to 3D printing.

I assume everyone knows that, generally, copyrights protect works

of authorship that are fixed in tangible media. And that includes a lot of the types of things that can be 3D printed. Primarily, jewelry and toys I would say are the two applications you see now that cover objects that are capable of being protected by copyright.

Once you have a copyright, it's protected regardless of whether it's registered. It lasts for seventy years after the death of the author. And it confers on the owner certain exclusive rights to reproduce and distribute. Those are really the most important ones for the purposes of today's discussion.

When you're talking about copyright law and 3D printing, copyright law only comes into the analysis when you're talking about printing items that are themselves subject to copyright protection.

And a large volume of material on some of the sites that I visited are not going to even fall into that category. You know, cases for your cell phone or common objects that aren't, that don't meet the requisite standard for copyright protection. So my whole discussion, I want to sort of caveat it with, I'm only talking about the analysis of copyrighted objects.

And so then the second part, which I think is going to maybe be a little bit controversial, is a dot STL file itself that is subject to copyright protection. And I think there's been maybe an assumption on the last panel that's not the case.

My analysis—and I think the analysis of content owners—is that if you create a digital file which is basically a blueprint of a copyrighted object that lets you render that file in three-dimensional object in two-dimensional form on a computer and then print it out, that that in and of itself would be within the scope of the exclusive rights of a copyright holder. Why? Because it would be a derivative work.

You're taking a copyrighted object and you're making a digital file of it. That would be itself considered a derivative work. There's a Second Circuit case law to that effect. So that's an important sort of piece of the analysis. Is the underlying object copyrighted? And if it is, the 3D model file of that copyrighted object is itself within the scope of the copyright owner's rights.

So then, when you talk about copyrights, you look at direct and secondary liability. And I'd like to maybe just walk through a couple of examples of how those issues might be analyzed from the perspective of a content owner.

I think the first step is who's doing the act of copying. Let's look at it from the perspective of the end user. I'm sitting in my apartment. I have a great 3D printer that I use. And I'm printing out a copyrighted object for my own personal use.

Well, under the classic definition of copyright law, I'm making a copy. I am reproducing a copyrighted work, and it really doesn't matter

if it's for my own personal use or if I'm selling 10,000 copies. The way most courts have looked at it, they say if you're reproducing a copyrighted work, that's not a fair use. That would be the Napster case.

So, I think the same analysis would then apply to the uploading and downloading of a dot STL file for a copyrighted object. Under the classic analysis, where you are reproducing or you're uploading or downloading a copyrighted file as an end user, there would be an argument that you're violating the right of reproduction or distribution.

So how does this play out then in terms of the broader scale, like some of the companies that we heard from earlier? Well, if you are a 3D printer—so you are on behalf of your users printing out copyrighted objects and selling them—that pretty clearly would violate an exclusive right of reproduction.

Because you're actually printing out, you're fabricating physical products in a way that's really no different than any other sort of commercial enterprise. You are, in essence, a factory. Someone's providing you a file, but you are supplying the materials. You are fabricating it. You are manufacturing it. And you are shipping it.

So, in terms of your risk assessment as a business operator, I think that would be the highest level of risk activity. And I think that there would be a very difficult argument to make that that conduct is subject to the DMCA, which I'll talk about a little bit later.

So then, the next category of actors are the Web sites that actually host these files themselves, like the TurboSquids and Thingiverses of the world. These are companies that don't fabricate products, but they host these CAD files and provide an online marketplace for the uploading and downloading of those files by their user base.

There is some argument that those actors would themselves be committing direct copyright infringement by doing that. Although that's a very tough argument because, under copyright law, the way it's developed, you have to be engaging in volitional conduct as one of those types of site operators.

So if you're providing a platform for users to upload and download these CAD files, there is a strong defense to a claim of direct infringement that you're not engaging in any volitional conduct yourself, you're just providing a platform for your users to engage in conduct that may or may not be infringing. So that's how you might look at the issue of direct liability.

But then there's a whole second prong of copyright law which deals with secondary liability. And there's really three primary theories. Vicarious liability, and there the issue is, do you have the right and ability to control the infringing conduct? And if so, do you derive a financial benefit from it?

And in terms of your risk assessment as one of these businesses,

the theory of secondary liability is the one you need to be the most focused on. Because there is a pretty good argument that if you're providing one of these online platforms that lets users upload these CAD files, you may exercise some control over your user's activities.

You can have terms of service. You can say, "No, you can't upload a CAD file for a firearm." You can make decisions as the platform operator that may give you some legal liability, because you're exercising some control over what happens on your platform.

And then, in terms of the financial benefit prong, there's also some exposure there because the way the business models for some of these sites work is that there's a revenue-sharing arrangement. You allow your users to sell these CAD files, but you take a percentage of the sale.

You have less risk there if you run a business model like Thingiverse where it's all offered for free and you're just promoting; really you're trying to get users into the 3D printing space and sell them hardware. There's less risk there.

The other two theories, just to cover really quickly before I pass it on, are contributory infringement and inducement. And those are much, much tougher theories to pursue in this type of space. Why? Because contributory infringement requires two prongs, knowledge and material contribution.

And the way the knowledge prong has developed is that you really have to have fairly specific granular knowledge if a particular file that's available on your site—like a particular CAD file—is actually going to result in the printing of a copyrighted object. So that's a tough argument to make if you're analyzing the site from the perspective of an IP owner.

Material contribution, you'll probably meet that criteria, because you print the file out and it's a set of instructions for your printer to render the file. So a lot of courts would consider that to be a material contribution.

But again, the problem with that claim is that you're going to be subject to a Sony Betamax defense, which is that all these platforms and this whole technology has substantial non-infringing uses. So that's not a theory that you would really expect and, for that reason, I don't think any content or brand owner would really target a manufacturer. That would be the most difficult claim to pursue because there's incredible non-infringing applications.

And then the last theory is inducement. That means you as the site operator are actively encouraging your users to commit copyright infringement. And that's really no one in this room, no one on the panel. But to give you a perspective from the industry of the content industry, one of the most notorious infringing sites on the planet is called—you may have heard about it—Pirate Bay.

And every time the owners get arrested, they get shut down, and then their server's moved somewhere else and they're still up and running. And that's a torrent site. But I think what caught a lot of content owners' and brand owners' attention was, the Pirate Bay sort of devoted a category on its site to what they called fizzables, which are actually torrent files for CAD, for .SCL files.

And so I think that was at least a perspective that raised an alarm bell that, while there's companies that really have good intentions and plan to follow the law, there's also a sort of pirate offshore element that could use this technology for an infringing purpose.

Mark Bartholomew: So, I'm going to talk about trademark law in all this. But let's try to frame it before I go into that and just talk about secondary infringement liability, which I think was really sort of an open road if you went back before the file sharing wars in the '90s. Not that it's all clear now, otherwise we wouldn't have something to talk about. But I think some avenues have been closed off and some are still open.

So I'll try to talk about some of this from a perspective of a rights holder who's thinking about which things are closed off to me and which are still open.

So from the perspective of trademarks, I think that rights holders are concerned about 3D printing and what it might do to their business models. I think trademark law might be an attractive option for a couple of reasons.

One, there's no statutory safe harbor like the DMCA, so it might be more attractive than going for a copyright claim. There isn't a Sony doctrine officially for trademark law, so that might make it an attractive way to go. And then, just in general, you'll have the problem of direct infringers you can't go after. There's too many of them. What they're doing is too small. How do I find the choke points? How do I find the people to stop what's going on? From the perspective of rights holders who are concerned about this.

I'll use an example here because I like having props and examples. So, I've got Optimus Prime here. And I have a friend who's a science teacher in Buffalo where I teach. And they have a 3D printer that they use in the classroom, but he just made this on his own for fun. It's a stencil so he can put powdered sugar on his kids' pancakes and they see Optimus Prime in the morning.

So when you see this, you think it's actually a Hasbro trademark, so maybe they'd be totally cool with the stencil and therefore you don't have to talk about it. But, assuming they're not, they have a different perspective than the Pony situation. Is there any argument against the actual manufacturer of the 3D printer that allowed my friend Jeff to do

this?

Is there an action against these online trading posts for the files, the CAD files, that he used to find this? And is there any action potentially against a printing service? Jeff did it himself with a 3D printer at Williamsville North High School, but let's say he hired someone else and paid for it. I think we know a few things about what actions would be possible and what wouldn't.

First of all, let me go into vicarious infringement. Just like copyright, there's these three flavors of infringement with trademark law: vicarious, contributory, and inducement.

Vicarious is a little bit different when it comes to trademark. And the courts require that there be a direct financial benefit. That should sound familiar as with copyright. And there has to be a particularized relationship with the direct infringer, with the person who actually went out and, let's say, made this stencil and is using it in a supposedly confusing way in commerce so that they'd be a direct trademark infringer.

And the way the courts have construed this, at least when it comes to trademark law is, is that it's going to be impossible to get any liability against any of these folks for vicarious trademark infringement.

When it comes to direct infringement, the courts have said that "direct" means something. You have to get a cut of the infringing proceeds before we're going to say there's a direct financial benefit, and that's going to be hard to show against any of these entities.

They're just saying pay us a flat fee to make Optimus Prime. They're not saying, "Give us pennies on the dollar for each infringing copy you sell." But more importantly, courts really require a particularized relationship with the direct infringer. And it has to be a partnership or an authority to bind that direct infringer in transactions with third parties.

And so what we've seen is that the courts--in trademark law at least--have really emphasized the formal, I think, over the substantive. And they've said, "You know what, it's a really high bar to find vicarious infringement." There's been several successful cases in the last few years where copyright plaintiffs had made vicarious infringement claims.

On the other hand, it's been a while since I've updated my research, but I haven't found any ultimately successful vicarious trademark infringement claims. In fact, I even found one district court decision that awarded attorneys' fees to a defendant because he said the plaintiff came in and alleged an apparent partnership was enough for vicarious trademark infringement and, since we've never found a case where an apparent partnership led to vicarious trademark infringement, we'll grant attorneys' fees.

So, I think vicarious trademark infringement wouldn't be an option if you're the rights holder and you're concerned about Optimus Prime.

So that brings us to contributory infringement. And here I'd say I have good news and bad news for the persons concerned about 3D printing and unauthorized use of their trademark. Contributory infringement requires a material contribution to the infringement and knowledge of the infringing conduct.

First of all, the good news is for material contribution. The courts have been pretty generous and said there's a lot of things that can count as a material contribution. So if you're the site that prints this out on command for someone, that's a material contribution. You're creating the site and facilities for this to happen.

If you're just the sharing site—that online trading post that allows somebody to find the program for the Optimus Prime stencil—that's probably a material contribution too from the cases I've seen.

But where the bad news comes in—and again, this is from the perspective of the trademark holder—is how do we show sufficient knowledge so we can make one of the entities liable, to have knowledge of the infringing conduct? And as with copyright law, the courts have been clear that a reasonable anticipation of infringement isn't enough. Generally suspecting that a lot of people are using your service to infringe isn't enough.

You have to have specific knowledge of particular actions of infringement. And you have to know that Jeff is actually taking this and making an infringing version of it that's going to confuse people. The eBay case in the Second Circuit here, even though it's about four years old, is still the most important case here, I think.

And that case says that, for contributory trademark infringement liability to lie, a service provider must have more than general knowledge or reason to know that the service is being used to sell counterfeit goods. You have to specifically know that there's particular actual infringement activity going on.

Also, I think what's going on in the trademark realm is, even though there isn't a Digital Millennium Trademark Act, we see all these businesses sort of acting like there's a de facto takedown and notice regime.

I know a lot of the 3D printing Web sites for sharing of files are taking this approach. What happens if you voluntarily take notices from trademark holders and take stuff down immediately? Is that enough to avoid the knowledge requirement? The answer is yes. So if you have a robust notice and takedown regime, that should be enough to avoid the knowledge component that someone would need to position contributory trademark infringement against you.

And we can talk maybe a little bit about whether this is a good

system or not. Should we even be adopting a notice and takedown regime in trademark? But that seems to be what's going on and the courts are legitimizing it.

One piece of good news for the trademark holder after this bad news about the knowledge requirement is that we have this willful blindness concept kind of lurking out there, like an 800 pound gorilla, but you can't really see him. So I guess he's the 800 pound gorilla in the closet.

So what the eBay court and other courts have said is, "We require specialized knowledge, but we'll find the knowledge requirement satisfied, if you can demonstrate willful blindness on the part of the accused contributory defendant."

This is still a very gray area. I talked about how there's certain kinds of tributaries that have been closed off in secondary liability law. This one, I think, is open for business. And so one thing I wonder is, to the extent we're sort of handicapping how courts will react to all this, to these kind of destabilizing technologies, will they respond the same way they did to the file sharing threat in the late '90s?

And in those cases, you see language saying we need to reverse engineer the law to position some liability here. There's language that says, well, because it's impossible to go after the direct infringers, this is the only practical option. So let me think about how to construe a secondary liability law in a way that will at least allow these rights holders to get some purchase here.

It's going to be hard to do that now that we require specialized knowledge for contributory infringement, whether we're talking about copyright or trademark. But there's some room to maneuver I think, when we're talking about willful blindness.

The eBay decision again holds that willful blindness is when a service provider has "reason to suspect" that users of its service are infringing a protected mark and then it goes on to say that they are looking the other way. Well what does "reason to suspect" mean? What does "looking the other way" mean? That's pretty vague, right?

We have a little more purchase on this from the Supreme Court's decision recently in the Global-Tech case. That's a patent case. But they say willful blindness equals a subjective belief that there's a high probability that an infringement is taking place, and that the accused defendant has undertaken deliberate actions to avoid learning that those actions have taken place.

So maybe when we think of our different 3D printing parties, maybe the file sharing site has hidden some information from its lawyers. That's a deliberate action. Do they have a subjective belief that infringement is occurring?

Maybe they did a market survey and they found out that all their

predicted clientele want to use this to infringe the Optimus Prime trademark? I don't know what other scenarios might apply, but looking for the kind of evidence that adds up to subjective belief and deliberate action will be crucial.

But these are really open questions and I think that's the area where we might see a lot of activity when there's finally litigation and these cases get decided.

Maybe just kind of a last point here is that we normally think in intellectual property of copyright and patent being levers for innovation. And the $64,000 question is how do we balance that incentive we need to give to the original creators with the ability of downstream actors to use those creations themselves?

And nobody has the answer as to where that sweet spot is. But that's the question we wrestle with with copyrights and patents. We don't normally think of trademark in the same way, but I could see to the extent we may have years of litigation about 3D printing, trademark might be brought into service and it'll be used to settle some of these questions.

Katherine Strandburg: Okay. So I'm going to talk about patent law. And I think it's very, actually, interesting. I'm going to be a little sort of detailed patent professor nerdy about this. Because I actually think that patent is perhaps quite different from copyright and trademark in terms of its implications here. And so I think it's wise not to just lump them all together.

And there are a couple of big reasons for that in patent law. One reason is that in patent law in general, infringement is both more difficult to prove and easier to prove than for copyright.

So it's more difficult because you actually have to look at the patent. So there's a patent out there. There has to be a patent. Somebody has to have applied for a patent. You don't have to have applied for anything necessarily to get a trademark and you definitely don't have to apply for anything to get a copyright. So there has to actually be a patent. That's very important.

The way in which it's easier to prove though, is that there is no requirement of copying. So you can infringe a patent without copying anything. If you're an independent inventor, if you know nothing about the patent, if you make something that is within the claims of the patent, then you are an infringer. So patent law is different in that regard.

Patent law is also different because in patent law, secondary liability is statutory. And it's been around for a long time. So it's not something that the courts are tweaking. Sure, there's a lot of room for judicial interpretation, but we have a statute. And the statute gives us two types of secondary liability.

One is inducing infringement. And the other is contributory infringement. Those terms sound familiar by now because you've heard them from the people talking about copyright and trademark and that's because they copied from patent law. However, the meanings are not nearly, I think, quite as squishy. I don't know if other people will agree with that.

But for any of these kinds of secondary liability, you've got to have proof that somebody actually directly infringed the patent. And direct infringement here means, again, one of a few statutory legally listed things, like making, using, offer to sell or import.

All types of secondary liability also require a fairly high level of knowledge or the new one is willful blindness, which the Supreme Court talked about in the Global-Tech case. But I think it's kind of interesting to know that willful blindness came up in the patent law area as a rejection of what the lower appellate court—the lower appellate court in patent law is the Federal Circuit—had said which was that deliberate indifference was enough.

So willful blindness is seen to be a pretty high standard. Especially when you consider that the kind of knowledge that you have to have for secondary liability in patent law is knowledge of the patent and knowledge that you're infringing the patent. So you have to know that there's a patent out there and you have to know that you're infringing it.

In the same way, willful blindness is not just willful blindness in the sense that there might be something out there doing something infringing. You have to be willfully blind to infringement of this patent. So depending on your perspective, I think that makes it much better or worse, or a happier or sadder story than copyright and trademark.

I'll go through each of these one at a time. But as I go, I'll talk a little bit about how they relate to 3D printing.

So the first question you have to have, if you want to talk about infringement liability and secondary liability in particular, is: where's the direct infringement? Who's the direct infringer? So in the 3D printing area, you have sort of two likely categories of direct infringers.

One is the people at home who are doing their personal 3D printing. And then the other one is custom printing shops, small manufacturers and retailers or large ones too, but kind of the new part of it is smaller manufacturers and retailers.

So in thinking about this in terms of patent infringement, one question you might think about is: how likely is it that the person at home with his garage 3D printer—or maybe it becomes his study 3D printer, or family room 3D printer or something—is actually going to be doing much in the way of patent infringement? And I guess I have a little bit of skepticism that that's going to be a huge issue.

Because I think that printing an object really isn't data. So making

a copy of a digital thing is very, very easy for anyone. Printing something from a 3D printer, even when we all start to have 3D printers and so on, is still just not the same thing.

Even printer printers, like inkjet printers and laser printers, are much more of a pain than making a digital copy. When you're talking about printing an object, it's going to be even more of a pain, no matter how good the printers get.

Also, of course, you're going to have to have materials to make this stuff with. So it's not just data, it's not just ones and zeros. You're going to have to have materials. And with your typical person, with our typical 3D printer, I think it's going to be quite some time before they're going to want to have a whole bunch of different kinds of materials and all this kind of stuff.

So I think that a lot of things that people are going to be doing in personal 3D printing are probably going to have copyright issues, and may have trademark issues, but are fairly unlikely to have significant enough patent issues that manufacturers are going to find it worth their while to go after.

There's a little bit of evidence that, at least right now, this might be somewhat the case. I ran into a study of 12,000 different files on Thingiverse. And it seemed that something like half of them are for things that seem pretty unlikely to be patented. Models, art, fashion, toys, maybe hobby, learning, and then the non-3D printing category which I found. Really, on Thingiverse there's a non-3D printing category. Apparently, there is.

Then of course the other half are things that could be patented. Household gadgets, tools, and most interestingly enough, the biggest category: pieces and parts for 3D printers. Again, that's something that I think people who are hobbyists in 3D printing are going to be likely to do, but most of us are not going to make them. We're going to go buy that stuff.

Another interesting thing they found in their study was they looked at the 200 most downloaded items and found that twenty-three of those were what they called substitutes—what I think we could call copies of things—that are out there on the market. Now, I don't know exactly what their criteria are, or whether they would be the same as copyright criteria. Probably not. I don't know, is that a lot? Is that a few? It doesn't seem to be an overwhelmingly large number.

Perhaps I'm totally wrong about this and you can all tell me. But my feeling is that the real concern is that the real direct infringement players here are going to be custom printing shops and small manufacturers and retailers. You know, people with a business that is making these things. And so, I just think that that's going to be where the action's going to be for patent law.

I just wanted to mention one thing. It is true that a lot of the things that I'm saying will probably not be patented might very well be amenable to design patenting. So, maybe we'll start to see that becoming a bigger thing. But a lot of things that could be design patented aren't, because people don't find it worthwhile. That's changing.

So now, moving on to secondary liability. If you want to show inducing infringement, we already mentioned the Global-Tech case that says you have to have actual knowledge of the patent and of infringement or this willful blindness, which is a lot more than deliberate indifference.

And we have a pending case in the Supreme Court right now, where even if you know about the patent, and you know that you technically infringe, if you subjectively believe that the patent is invalid, that might be a defense to induced infringement.

There also is a requirement besides the knowledge that you are doing something of active inducement. And I think that's somewhat similar to what's already been discussed. But I think it's highly unlikely that just hosting a forum for posting is going to be enough to be considered inducing infringement.

It's not even clear whether, if you make a copy of something with your non-existent 3D scanner and you upload a file, is that even enough to induce infringement? Or do you have to do something more specific? That's an issue I'm sure that the courts will get to eventually in this area.

And then there's contributory infringement, which is quite a different beast in patent law than it is in copyright or trademark. First of all, you only can do contributory infringement if you sell, offer to sell, or import. So if you're not selling something, you're not contributorily infringing unless the courts decide to really stretch that.

Secondly, the thing that you are selling, offering to sell or import has to be a component of a patented invention. And we already have case law from the court that tells us that a blueprint is not a component, software on a master disk is not a component. So I would say it seems highly unlikely that a 3D printer file that you use to make the thing is going to be deemed to be a component, given the current law we already have on the books.

In addition, you have to know that the component is specially made for use in infringement, and not a staple article of commerce suitable for substantial non-infringing use. So it takes a lot to do a contributory infringement.

Contributory infringement in patent law is aimed at people who are really trying to avoid being a direct infringer by putting together all the pieces of something that's patented and then selling it, something like

that.

So where does that all lead in terms of conclusions? A main point I want to say is that the 3D printing situation, I think in general and particularly for patent law, is very different from the peer-to-peer file sharing issue from the trademark and counterfeiting issue on eBay.

Primarily because, for patent law, it's very unlikely that uploaders are going to be infringing the patent unless they are, whether directly or indirectly infringing, secondary or direct infringing. Unless—and this was the one thing I thought of—I take something that is marked and has a patent number on it. And I file off the VIN number. I remove the patent marking and then I upload the file. That might be something that would count as inducing infringement for an uploader.

Similarly, I think it's pretty unlikely that most file hosting sites or printer suppliers are going to infringe. So I think the people at most risk for patent law infringement are the 3D printing shops and small manufacturers and retailers. And that's not because of secondary liability, that's because of direct infringement.

And direct infringement requires no mental state at all. No knowledge, nothing. So I think that's the place where the infringement cases are likely to be successful, where it won't matter that you can't show willful blindness or whatever.

It would be possible to sue consumers who print at home. But they're not attractive targets as the record industry learned quite well. A lot of things they particularly decide to print won't be patentable.

One of the things that I think might be interesting to think about in the patent area is that most things that are 3D printed can be marked. And so I think it's possible, and this is just speculating, that patent marking may begin to play a much more significant role here. Because if something is marked with a patent, and then you go ahead and copy it and upload it, it just starts to look much worse. And you'll know about the patent.

So—and this is very, very tentative—what do I kind of conclude from that in terms of policy thinking? The first thing I think is that I don't see any reason to rush to try to change the law to beef up patent infringement liability. I think existing legal tools, including marking, may be quite sufficient to address the most commercially significant infringement.

And in fact, I think it's possible that what we should really be concerned about is that there may be too much liability risk for 3D printing shops and small manufacturers and retailers, who might be deterred by the potential IP liability and other liability, which was already mentioned in the previous panel, and product liability and all these kinds of things.

And I also think that that's a problem. Because things are not data.

I think these institutions may be very important if we want to realize the potential of 3D printing and all that creativity that people have out there, and all of the crowdsourcing and open source and so forth. I don't think we should be depending only on people's 3D printers they have in their family rooms.

So maybe we do need to do something in the way of some kind of safe harbor for these institutions who are at risk as potential direct infringers. Maybe a notice and takedown kind of approach. Maybe something that works more directly with marking. Haven't thought that through at all, so I would love to hear what people think. And that's it.

Felix Wu: Great, that's wonderful. So I'll address a few questions to the panelists here, particularly to try to bring together the different areas here. One thing I'd like to start off with is—and I think, Kathy, you were starting to think about this—what's the effect of what the structure of the market turns out to be, with respect to then what liability looks like?

In particular, on the one hand we have the touted model where everyone's got a 3D printer in their home and it's all about sharing the files, and then all the printing is happening locally. Versus the model where, in fact, the printing that's happening within homes is not all that significant, and what's really happening is that people are getting stuff printed elsewhere and the Kinkos of the world are really where all the action is happening.

So I think it's worth thinking about, well, what difference would that make even just under current law or what difference does that make in terms of the kinds of liability that are raised under one model versus another. So, thoughts on that?

Gianni Servodidio: From a copyright perspective, the most obvious issue is that the activity that you just described—running your own print shop—is not necessarily subject to existing safe harbor under the Digital Millennium Copyright Act. And why is that? Because the Digital Millennium Copyright Act is not sort of a blanket safe harbor. It protects specific kinds of activity. And the most relevant to this discussion is uploading content at the direction of a user.

But once you're engaging in the actual operation of a printing press or a printing company, you've gone beyond just merely hosting material that's stored at the direction of the user, to fabricating it on behalf of a customer.

There's a decision I think someone mentioned in the last panel. The CafePress case out in the Southern District of California where the DMCA defense was raised. I forget what the court said—it was an odd procedural posture—but the court's inclination was to hold that there's

not DMCA safe harbor for that type of activity.

So I think what's critical in terms of your analysis of liability is how the ecosystem emerges with the different players, and it's much more of a threat if you're a brand owner, or if you're a company that's running professional 3D printers that can fabricate very high quality products. Whether there should be a defense, is a question I'd throw out to my other panelists.

Mark Bartholomew: We'll get there. So for a trademark, I'd say that there's going to be a lot of problems with trying to attach liability to individual users. So, unlike copyright where if you make a copy in general you commit infringement, trademark has this use requirement. You have to use the trademark in a confusing manner. And that's another area of the law that hasn't been really sussed out, but it does seem that there has to be a use in commerce; a sale is what we're looking for.

And so, my friend the science teacher making the stencil? That's fine. I don't think that's the kind of party who has to worry about liability. We have to worry about the shops that are trying to make several of these stencils and trying to make some money off it. That's the part of the ecosystem we're worried about: the print shops that are going ahead and using these things.

I would hate to say that the law would snuff those places out, of course. So, how to give them enough breathing space? Part of me thinks we should just let the courts sort of organically navigate this. But I'm also worried about the track record with file sharing. So maybe some sort of Digital Millennium Trademark Act would be good for these kind of print shops too.

I'm worried about that too though, because the DMCA has some flaws. One flaw is that it's not always that speech protective. You get a notice and you take it down. And there's provisions for counter-notice in the DMCA, at least they have that. The way entities are operating with trademark law now, they get a notice, they take it down, that's the end of the story. So that's not very speech protective at all.

So maybe at least a DMTA could have a counter-notice provision. But, as I said, the DMCA has some problems too. So I'm not sure what the solution is, but, yes, I guess I'd focus—and Kathy mentioned this—I would focus on the print shops.

Katherine Strandburg: Just to follow up on that a little bit: I think it's worth thinking back to why we have the DMCA safe harbors. Why were they enacted in the first place? And also, we have a similar kind of safe harbor for defamation.

And these things came about because there was a concern that

businesses that were performing very useful functions in the Internet age of providing a place where people can share and post things and all this very important stuff, would be subject to a whole bunch of liability and they would really not have the capability to keep track of it all, or to know when there was infringement and when there wasn't and so on.

And that's kind of like one model. And then on the other side we have the sort of copy shop model where you're going to be liable and it's your responsibility, copy shop, to keep track of this stuff.

So these are two very different models that we have going on in the world right now. And I think the question is, how should we think about the 3D printing situation? Is it more like a copy shop where you could expect that they should be able to look and see that this looks an awful like what we're just copying, like, the entire textbook for this course? Is it more like that? Or is it more like a website that gets all kinds of stuff posted and doesn't have practical ways to weed through it? And even that changes over time.

So now there are many more ways to figure out whether certain copyrighted material is posted than there used to be. Although, figuring out whether it's fair use is not so easy. Anyway, I think that we should be thinking about what we are trying to accomplish if we want to think about this. Rather than whether there's liability or is there not.

As a social matter, we may want there to be businesses like this, because they may be doing things that are very useful in terms of promoting creativity.

Gianni Servodidio: The music analogy seems to be kind of apt here. I think there is a real sense that a start-up business should want to be engaged in licensing discussions with content owners if that's a significant part of the business model, and to do it aggressively and early. Spotify is the perfect example.

This is a company that didn't launch first, then ask permission later and get sued, and then have to settle or maybe go out of business. They waited for years and engaged in painful pre-clearance with record companies to get the rights to the catalog. Then they launched and became an enormously successful popular service that delivers streaming content in a very successful way.

I don't think that's a horrible model. I don't think there's anything wrong with that approach, as long as your business is premised around the use of that content. And I think where there's some question in the 3D printing space is: how significant is it for these companies to be able to offer copyrighted popular IP protected works? Or is this really more for the hobbyist, or for people engaging in public domain work? That to me is totally unclear.

But if the way the model is emerging and the way these companies

see their future is to engage in the sale of copyrighted, branded, protected products to drive traffic to their site and to create their business, then I don't think we need to change the law to say that you should engage in pre-licensing clearance to do that.

Felix Wu: So that's a good place to then go to the next question, which is: the Hasbro example was brought up a couple of times and held up as a model of, well, this is a good win-win situation for everybody and if everybody could just do more of this, then we'll all be fine.

Any thoughts on the panel as to whether or not, in fact, this idea that content owners just get together with the relevant parties in the 3D printing world and strike deals. They decide who in the community is going to be licensed to do this, and in what way, and which things they allow. What was the list again of things that were not allowed? So it was, as long as it was not too violent, not too sexual, and no saddles, right?

Gianni Servodidio: Yes.

Felix Wu: Okay, right. So is that the model that we should take going forward? Or are there hazards that you might see in adopting that approach as the solution to these kinds of questions?

Mark Bartholomew: I liked hearing more about the Hasbro situation and how it worked, and it seems better than massive litigation. I guess some concerns I have with that is that it sounded like there was a select group of designers in the community who were sort of picked, and I worried about the folks who don't get picked.

And I have the same sort of concern with a notice and takedown regime. What if you want to use My Little Pony for some sort of transgressive statement? And if you want to do that, a strict notice and takedown regime sounds like you'll get your design taken down, whether you are doing something subversive, or something completely on fours with the My Little Pony ethos.

And so I'm worried about notice and takedown regimes de facto or implemented through law that give short shrift to transgressive appropriations. I guess that's the thing I think we need to look out for. And maybe that's an area where we could have a safe harbor. Or think about designing a safe harbor that allows the fair use types of expressions that we want to allow here.

Katherine Strandburg: I guess I also have some concerns about this in that, when you're talking about copyright area, you have an

industry where there are a relatively small number of very big, very well-organized players. And so you know who to negotiate with if you're worried about copyright infringement. So that's, you know, Spotify.

There's just nothing like that at all in the patent world. And probably not in the trademark world, either. If you have no idea what your customers are going to be printing, you would have no idea who to go to to negotiate these licenses. And maybe you'd get fifty percent of them or something like that by going to the main toy companies.

But there are an awful lot of patent holders out there. And an awful lot of different patents, and even figuring out whether something is infringing is really hard. So I just think that's a pretty huge burden to put on a smaller company, or on a company that's going to be doing a big volume of business where they're not going to be looking in great detail at each thing that comes through.

So I don't know. I'm less sanguine about the possibility that that could work in 3D printing area.

Felix Wu: Great. So we've now mentioned the DMCA or other sorts of safe harbors a couple of times. Do any of the panelists have thoughts on what it is in the DMCA that you think would be particularly useful to borrow here? What it is that you think we might want to explicitly reject? For example, thoughts on red flag knowledge and its relevance here or not?

And alternatively, are there players in the system as to which we ought to be giving even stronger safe harbors? Kathy mentioned the Communications Decency Act, which provides for a fairly absolute form of safe harbor with respect to defamation claims that you don't find in IP.

Are there players here for which we think that that kind of strong safe harbor might be warranted, or is the basic DMCA model more or less right here?

Gianni Servodidio: Well, I think the DMCA applies in this context. I think we should be clear that, if the object at issue is copyright protected, and it's being uploaded in dot STL files to one of these sites, there's a copyright infringement claim and there's an existing safe harbor under the DMCA.

The DMCA itself is a disaster. I mean, it's one of the most complicated, difficult statutes and it just reflects a legislative compromise that was struck many, many years ago. I'm sure both sides of the table of the DMCA are extremely unsatisfied and it's been very costly to litigate. But short of amending the DMCA, we're stuck with it from a copyright perspective.

Just quickly on the other points you raised, I think there's different defenses that are going to apply to secondary liability across the board. There's fair use. There's the First Amendment.

There's existing defenses if the work at issue is expressive. I think the existing law takes into account some measure of protection for things that are non-commercial, that are non-infringing and so on. I'm not sure I see a particularly new safe harbor that needs to be implemented for this context.

Felix Wu: So, can I just follow up? One of the things that you said at the beginning was that the DMCA applies here, but once we start shifting to thinking about "oughts" rather than "is," would it make sense to extend the DMCA not just to, let's say, the sites hosting the files, but also the companies doing the actual printing themselves?

Gianni Servodidio: I don't know. I think that's a tough call. Why would they be entitled to a safe harbor? Is that conduct that you want to encourage? When you are printing and selling copyrighted goods and taking a percentage of the profits of the sale, do you want to impose all the risk on the brand owners to deal with that on a notice and takedown regime?

Or is there some sort of reciprocal obligation, if you're going to be doing the printing, to do some pre-clearance? I don't think that's really a close call from my point of view.

Mark Bartholomew: I guess for me it goes to Kathy's point: what were we trying to do when we enacted DMCA? What were we trying to protect? And the same with Section 230. Is this such an important area of commerce or expression that it deserves these special perks? And I'm excited about 3D printing, but I don't know about the printing shops yet. I don't know. So I don't know if I'd want to expand the DMCA to cover this.

I'm also worried about the DMCA, and even the common law of a trademark copyright contributory infringement, rewarding the big players. The DMCA is super complicated. You can say that's because of hashing things out and they had to kind of compete, and that's what happens when you make legislation.

But I think there's also a benefit to the opaqueness of the DMCA, in some ways, for big players. It helps people who are experienced with this stuff and can navigate it. It hurts the smaller businesses. And I like the idea of not just a couple of places that could print my CAD files for me, but several. So I would like to have my new DMTA, DMCA or whatever for these copy shops to be a little more streamlined. That would be one thing.

Also, if we don't even have a statute, look at the eBay case. What did eBay do in good faith to try to stop infringements? EBay poured a ton of money into these fraud detection programs. So, eBay leaves us kind of unsure of what to do if you're the small business. What do I have to do to avoid liability? Because I can't spend one hundred million dollars on an authentication program.

And so, I guess a safe harbor is worth thinking about, because the smaller shops aren't going to know what to do to avoid liability in some ways.

Katherine Strandburg: I think a lot depends on volume and control, meaning, to what extent is a shop making thousands and thousands of one thing—which would probably enable them to do a little due diligence—or to what they're making five of this and two of that and three of that and four of that. In which case, the due diligence would be a pretty heavy burden.

It also depends on how important we think the innovation coming from smaller types of innovators is. As in, the people who would need to use these kinds of shops to do something other than make copies of popular items.

Looking at the statistics from—and who knows how to interpret those statistics—but looking at the statistics from Thingiverse, it seems like a lot of those people are making creative things. And so I would be concerned about shutting that down.

And I think one other point about the copyright situation here is that with file sharing, it's true that there are fair uses. And even with the eBay situation, it's true that there are fair uses. But most of what's going on there, we all know, is not fair use, right?

With the copyright issue here, I think it's a lot trickier. Which of these things are actually copyrighted, given the useful article doctrine? You've acknowledged that in your presentation, right?

So, there might be a lot of these things that aren't even copyrighted. And I worry about a sort of takedown regime for those, because that issue is certainly not clear. And it's going to be much more common than the fair use question.

Gianni Servodidio: I think for that reason, unless I'm mistaken, you're not seeing brand owners or content owners jumping in and bringing big splashy cases against a 3D printing defendant. I think there's some caution because of that very reason. These are businesses that are operating at least in a manner that seems to be respectful of IP rights.

But I think to understand the perspective of the content owner, there's this abject fear of not getting out ahead of the curve when the

infringement starts happening. The infringement is happening, it's there, but it's at a really small, manageable level. So I think there's a great opportunity for some real dialog and partnership now.

Katherine Strandburg: What would you think about some kind of a minimum commercial value or something like that? As in, for a particular item? In other words, safe harbor for below a certain minimum value? So that way, you don't worry about making five copies of something. And it's only when you get up to making enough copies that you could feasibly think about doing some kind of clearance.

Gianni Servodidio: That might make some sense. Also, you have to keep in mind that there's going to be a lot of defenses if you're making one or two; it's a one off, it's a two off, and then you really can't be engaging in what would be considered willful or bad faith conduct. There's going to be lots of defenses to that that it happened under the existing law.

But I think the analogy of the music industry is really the right one here. How does the toy industry deal with this? They don't want to start suing all their customers. But they don't want to experience the decline in sales that the record industry did. So I think they're really grappling with it.

Felix Wu: Given the hesitancy of some of the content owners here, and given the maybe broader possibilities for defenses and the like, would anyone worry that the creation of a safe harbor might ultimately result in more control by brand owners rather than less?

Katherine Strandburg: You mean, because it would come within notice and takedown regime?

Felix Wu: Or something of that sort, yes.

Mark Bartholomew: Here, maybe I'll just spill out my thought. One thing that you might think about is that the current law and the current practice might be, in fact, on the side of folks in the 3D printing space, rather than on the side of the brand owners. One possibility might be that the creation of a safe harbor, particularly in the absence of any clarity on the law of secondary liability or otherwise, might sort of funnel all the activity within that safe harbor, whether or not the safe harbor was in some sense needed.

It could have turned out that, in fact, were you to not try to take advantage of the safe harbor and just take your chances with existing law, you would have won. But given the existence of the safe harbor, a

company is going to fit within whatever the parameters of the safe harbor are, as opposed to taking their chances with the development of the law.

Katherine Strandburg: That's certainly a possibility, and it depends a lot on how you would design the safe harbor.

Gianni Servodidio: I also think, regardless of the ambiguity in the law, the practice is really emerging that, if you're a brand owner, you're going to send a takedown notice. And if you're a site operator, you're going to ignore that takedown notice at your own peril. And I think that's just the way that it's going to go now, because it's so hard to prove actual knowledge.

So if you're a content owner or a trademark owner, you're going to develop your record of actual knowledge by sending takedown notices. So that gives the site operator a chance to assess and make a legal determination. Those are expensive legal determinations.

Felix Wu: Okay, great. So now, let's open it up to get questions from the audience. Are there folks who'd like to raise a question? Yes, in the back.

Audience Member: [inaudible question]

Felix Wu: Oh, now there's an interesting question.

Katherine Strandburg: There is a general idea that, I mean, it's kind of like what would it be for, right? So if we're talking about what something looks like on the outside, it's kind of hard to do anything with that, right? So maybe we'd be talking about reverse engineering something that is more in the trade secrecy side of things. So yes, I think saying that people can't take stuff apart to tinker with seems like a really bad idea to me. You lose your warranty, usually, if you do that.

Gianni Servodidio: I guess that brings up the point that, while one solution of this isn't the secondary liability doctrine so much, it's DRM, right? Let's use DRM, and when you take your printer home, you've got to plug it into the Internet. So when you download that file, maybe they'll do a search and make sure it's not a trademarked item or a copyrighted item.

I don't think we have the capability of doing that now. But, there's functions now where before I can install Windows, for instance, they're checking up on me and could see that. And then trying to get around that might implicate your anti-circumvention provisions. That would

make me nervous. I've seen it really get around the freedom to tinker, that's so important in the 3D printing culture, at least as it stands now.

Felix Wu: Other questions? Yes.

Audience Member: [inaudible question]

Gianni Servodidio: Yes. I think you apply the same question that you would under all these doctrines. Like, what is their knowledge, are they making a material contribution? There, I think the material contribution is more sketchy. If you're just providing a directory of available 3D printers in your network, then I think you can debate whether that's a material contribution and they probably don't have any knowledge of what they're being used for.

Now if you're running a 3D printing hub saying, "If you want to print out your Barbie dolls, here are five printers in Brooklyn who'll do it for you, because MakerBot won't do it for you," then they're liable for inducement. And by the way that happened.

Felix Wu: Any further thoughts on that? No, okay. Great. Yes.

Audience Member: [inaudible question about patents]

Katherine Strandburg: Well, it all depends on what the patents cover. A lot of what is in any technological device is not covered by patents, because it's not new and non-obvious. So patent law is a bar. You have to do something that's non-obvious. You have to go and apply for the patent. And the patent has to actually cover that feature.

If the patents don't cover those features and, of course, they're always arguments about that. But if they don't, then everybody can copy them and that's competition and we think that's a good thing. So, it is actually really different from copyright in that regard. Because in patent we say that it's not just enough that you thought of it. It has to be non-obvious compared to what's already been out there before.

Audience Member: [inaudible question]

Mark Bartholomew: Well, the history of intellectual property law doesn't have a lot of nice stories in this respect. Most of us spend our time criticizing the process that generates intellectual property laws and how these people got together in a room and did these things they shouldn't have and certain interests gamed the system so, I'm trying to think of a good historical precedent for you. Nothing jumps to mind.

Audience Member: [inaudible question]

Gianni Servodidio: I think you can look at Google—though I hate to tap them as the shining example—but as they got more established and more sophisticated, they took a lot of very pro-active measures to keep infringing content off their site. And then sort of these UGC sites have—I forgot what they call, like, I pledge allegiance to these principals or good UGC sites—and one of them is that you're going to do something proactively as the operator to curtail infringement. And what that might be and how far you're willing to go, that's up for debate, but that's something that some of my clients look at carefully.

Audience Member: [inaudible question]

Gianni Servodidio: Exactly. The courts and litigants have grappled with this all the time. It's like there's no affirmative duty on the site operator to go investigate, there's no investigative duty under the DMCA to go search out infringing content. But it can be one factor. Failure to take steps to mitigate obvious infringement can be a factor. It's a really tough line to draw.

Audience Member: [inaudible question]

Katherine Strandburg: Again, it just depends on how the patent is written. So, if the patent claims in terms of a particular material, and you use that material, then maybe it's better to say it the other way around. If the patent is claimed in terms of a particular material and you don't use that material, then you're not infringing.

I guess you could think about the question, how much should we be worried about the way that infringement might be a problem with respect to the development of materials? I haven't really thought about that much. Although, most of the time, it's probably not going to be such an issue because you're going to buy the material from somebody, the distributor of that material. Most likely, they will have dealt with patent issues and you won't have to worry about it.

You could have a weird situation where you just happen to pick a material that's claimed in a particular patent. But I don't think that's a huge issue, at least off the top of my head.

Gianni Servodidio: But maybe a version of that would be: how do we think about the follow on innovation aspects of 3D printing, right? How do we think about the extent to which it sort of democratizes the ability to play with and make changes to and do more with tangible products in a way that we've seen with respect to copyrighted works?

How do we think about what structures we might want to put in place to be able to encourage that kind of behavior?

Katherine Strandburg: Well, this is exactly why I'm so concerned about the print shops and so on. Because, in general, with the Sony case we've said, we're not going to count the technology as being infringing.

But with 3D printing—to the extent that there are going to be a lot of people who are going to be designing things, but are not able to print them themselves—the printer or print shop is almost like part of the VCR in a certain sense.

And so I'm concerned about the health of those kinds of entities for the purposes of encouraging the kind of user innovation and other kinds of creativity—crowdsource creativity—that we would hope to get out of these 3D printing and similar technologies.

I also understand that if, instead, we're printing thousands of My Little Ponies, it's a different thing. But I hope that we're going to come up with some kind of system that will not leave those players completely vulnerable.

Gianni Servodidio: The good news seems to be that individual home users tinkering are going to be off the hook, legally speaking, I think for the most part and also just from a realistic sense of who you're going to litigate these claims against. So, to the extent they want to tinker with different materials, I think they'll be allowed freedom to do that.

With the print shops, I'm worried about a situation where maybe you're doing something really creative, innovative, subversive with a new material that Mattel would never think of. And I'd hate to have that squashed with just a quick notice and takedown.

Mark Bartholomew: Putting Barbie in a blender?

Gianni Servodidio: I was thinking of that, yes.

Felix Wu: We have time for one more. Anyone else? Yes.

Audience Member: [inaudible question]

Katherine Strandburg: In one sense what they can do is, when they see the thing that was their idea out there, they can find out if it's patented, and they can go and challenge the patent, which is now a lot easier to do than it used to be. Now that we have post-grant opposition. I mean, it's kind of hard to tell, because our post-grant review is very

new, how effective that's going to be for smaller players.

Gianni Servodidio: I also think you can get a copyright on a CAD file. If you create something, a unique and original CAD file, and design it and put it out there and someone copies it, you could have your own copyright in that that you could enforce.

Felix Wu: Okay, great. Please join me in thanking the panel.