The Culture & Technology Podcast
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Episode 11: Product Design
Julia Körner

INTRODUCTION

Can 3D printing bring us closer to nature?

3D printing has reached a level of quality and complexity that the boundaries of what's possible with the technology feel almost limitless. We can create entirely new shapes, geometries and materials that would be otherwise impossible to manufacture and in many industries, it's helping to make processes more efficient and more sustainable. Julia Koerner is an innovator in the use of 3D printing in the fashion space and that's why we took the time to sit down with her to better understand how these processes and her work are continuing to evolve.

GUESTS

Julia Koerner is an award-winning Austrian designer working at the convergence of architecture, product and fashion design. She is internationally recognised for her innovations in 3D-Printing as well as her work on the Hollywood blockbuster, Black Panther.

HOST

Severin Matusek is an editor, producer and strategist who has spent the last decade researching how technology transforms culture, communities and society.

IDEAS AND PEOPLE IN CONTEXT

- **Archinect** is a top online destination for progressive-design oriented students, architects, educators, and fans. https://archinect.com/
- **Ross Lovegrove** is a designer and visionary whose work is considered to be at the very apex of stimulating a profound change in the physicality of our three dimensional world. http://www.rosslovegrove.com/
- **Artemide** is one of the most known illumination brands in the world, synonymous with design, innovation and made in Italy. https://www.artemide.com/en/home
- **Iris Van Herpen** is a Dutch fashion designer. https://www.irisvanherpen.com
- **Ruth E. Carter** is an American costume designer who worked on Black Panther. https://en.wikipedia.org/wiki/Ruth_E._Carter
- **The Sporophyte Collection** is a collection created by Julia Koerner. https://3dprintedart.stratasys.com/juliakoernersporophyte

CREDITS

The Vienna Business Agency supports businesses, the economy and the city in developing the Austrian capital's creative industries and shaping its future trajectory. viennabusinessagency.at

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Theme Music by Zanshin.

TRANSCRIPT

Severin Matusek

So we are talking about the future of fashion and technology today. I've been doing my research and I saw that in a publication about a year ago, you were called the architecture Queen of 3D fabrication. Please elaborate, what's the story of being the architecture Queen of 3D fabrication?

Julia Koerner

This was a very nice article in Archinect and I think-one of the more extensive ones, which took a deep dive into my experiences over the past 15, 20 years within the industry of architecture, but also within kind of-my work which crosses into other disciplines, such as product design and fashion design. I think that the title kind of came from our conversation about how complex computational design and digital design is and how the translation towards the reality making the creations tangible, has so many different routes. A lot of those routes opened up with digital fabrication, and emergent technologies, such as 3D printing, CNC milling, and robotic fabrication. I have explored those fields intensively starting at the University of Applied Arts in Vienna, and later on at the Architectural Association in London and over the past 10 years, I've been a professor at UCLA, looking into digital and computational design and robotic fabrication. And also professionally, I've explored this field extensively with many collaborations building up a brand, looking into kind of how can we utilize these emergent technologies in the various different fields? And how can we utilize architectural processes for different applications, then we might think in the first place.

Severin Matusek

I'm curious, I'm an outsider to this scene. So I don't know anything about 3D printing, I don't know anything about algorithms and architecture and to me as an outsider, I think it often seems like oh, nowadays, you can print almost everything 3D. You know, there are large printers, smaller printers, and all you need to do is create a model on your computer, and then you hit a button, and that machine is going to print it. But of course, it's not that easy. So I wonder from when you started 15 or 20 years ago - and I know that somehow you first discovered a 3D printer at university where they got delivered and nobody knew what to do with it. So how did 3D printing evolve over the last 15, 20 years as part of your career and your investigation into it?

Julia Koerner

I think that 3D printing can be understood as a technique of a fabrication, which is wasteless and a technique of producing a design which is very complex and I mean, in terms of geometry. So, very organic forms, which have a lot of shapes and curves, and which cannot be necessarily produced with traditional fabrication techniques. You can produce various colors and materials, which are maybe different and you can introduce aesthetics, which don't look like they are handmade, and so they can have a very different aesthetic.

This technology was really attractive for us as students at the University of Applied Arts because we were exploring 3D software in designing architectural projects with the computer and thinking about how can we re-envision spaces? How can we re-envision experiences? How one experiences space by looking at references, but also by innovating on novel geometries, which were only possible to produce with the computer. And then as the next question came, well, if we can visualize those with the computer, how can we make them tangible? How can we output them?

So these kind of computer numeric control techniques allowed us to realize those forms and shapes with non-traditional methods of fabrication. So what a 3D printer does in basic is it takes a geometry, and then it slices it into sections and then it lays out material layer by layer and builds up the geometry in a physical space without utilizing any scaffolding or outside mould material, which is later on being wasted. So you really only need that material in the production, which is the one you need in the final product, which is revolutionary, because you can produce in a sustainable way. Also, because you have the digital files, which you create with the computer, you can send them internationally anywhere where you are, maybe in Los Angeles, so in Vienna, and you can 3D print your designs, if you have a machine on location. So you can print on location, and you can print on demand.

So you don't have to mass produce in advance in a different country, you can actually produce everything what you want on location. That means you know, what kind of materials go into the machine, you know, what resources you use, and is the kind of innovative new way of fabrication. What I thought was interesting in the architectural world, and to come back to your question about how it evolved, was that at the beginning, the machines were very small, and there was a limitation. And we utilized in architecture, machines to produce architectural models. Later on, the machines developed got larger in scale and over time, we were able to produce complex geometries on larger scales. Today, we can 3D print already buildings or bridges or larger scale furniture. The technology has advanced a lot, and so has the material developed as well. So we can print today with biodegradable materials, plant-based

materials, ceramics, a lot of materials, which we couldn't even have imagined 15 years ago.

Severin Matusek

So when you say buildings and bridges, that means entire bridges, like 10, 15, 100 meters long are being printed with 3d printers today?

Julia Koerner

I think the largest bridge I saw is about five meters so I think if we were talking about 100 meters, then you probably would print it in parts and put the parts together but yes, there are robots and technologies, which allow us to already go larger in scale with 3D printing technology.

Severin Matusek

Can I envision the development of 3D printing of the last 15 years similar to computers, the internet and computing power? That simply if you compare a computer from today to a computer from 15 years ago, it's 100 times better, it's 100 times faster, it's 100 times more powerful. Is this the same with 3D printing? Did it go as fast in it’s development as other technologies?

Julia Koerner

I would say that the precision and the advancement in the resolution, advanced, perhaps maybe more in a smaller scale than in the larger scale. So I know that, for example, in the medical industry, there was a lot of research produced of how to 3D print cellulose, or how to 3D print bone structures, even hearts, organs they are 3D printing. And so I think that there was a lot of research in qualitative development in the medical industry, I think in the 3D printing on on the larger scale, we advanced the size, I wouldn't say we necessarily advanced the precision or the kind of complexity. So detailed 3D printing, with highly complex geometries, I think is still more advanced on a smaller scale. Your comparison’s kind of interesting because with the computer, everything went from like a room size computer to a smartwatch, right? So it went down in size. Whereas in the 3D printing it went larger. It went up but in many different directions actually. I think that there was just so many developments in so many disciplines which are really great.

Severin Matusek

You started with 3D printing as part of your architecture studies. So you trained to be an architect originally and then at some point, you discovered that you can actually 3D print on fabric and create some sort of fashion pieces out of it, and you created your first clothing. So how did that work? How did the discovery work? When was the first time you created a fashion item? How did that develop?

Julia Koerner

So one thing that was really interesting at the Angewandte was that the way of how the building was organized, was that there was on the ground floor there was Wolf D. Prix architecture studio, and then sandwiched in between was product design and then there was Greg Lynn's Studio another architecture studio and then on top of it was fashion. So while we were kind of moving through the building, we met a lot of other designers in the various different disciplines. And so, as it turned out, we were going to the fashion designers to help us on sewing tents for a Red Bull pavilion design, while the architects were kind of involved in 3D printing and fabricating shoes for the fashion designer. So that was kind of my first exposure to the transdisciplinary approach and what these technologies allow us to do.

Other than that, I was working for five years with Ross Lovegrove. I started working with him, he's an industrial designer in London. I started working with him while I was still a student, and then actually moved to London, and explored with him the application of architectural design processes in product design. So I was involved in several light designs we did for Artemide, where we looked into the complexity of utilizing techniques, which are produced by architects in the computational design process and how to apply them on to products and kind of understanding that translation of software, the translation of methods of precision, because it's quite different scale.

That was really interesting and around that time, I was also starting to design my first products and fashion pieces. I got to know a 3D printing company really well, Materialize in Belgium, and through my work with them, they started to recommend me to fashion designers to work with 3D printing in fashion design. So some of my first collaborations were with Iris van Herpen or one of the very famous fashion houses in Paris, one of the oldest embroidery houses Maison Lesage and kind of looking into how we can realize entirely three dimensionalized fashion pieces, which are then 3D printed in three dimensions so that what came before printing on fabric or anything.

Understanding how can we 3D print with flexible material and you can imagine a full dress just coming out of a machine as a three dimensional piece. At the beginning, it

was still hard because we were only having hard materials, so it was quite brittle, but then the materials developed in advance and we were able to print in flexible material and most recently, I've been exploring the 3D printing directly on the fabrics. I think that that one is actually kind of an interesting one because it's almost 2D printing because you're putting a textile into the machine and then you're 3D printing on top of it. You're not necessarily creating the dress in the third dimension. It's a bit complex. I don't want to go too much into it but this is how I kind of got into the industry first through a lot of collaboration with fashion houses and then I always felt they were so short because there were only like two months to design things.

Then it went on the catwalk, it went into Paris Haute Couture, and then it was shown in museums, such as the Met in New York but then it always stopped. I always was so curious how to continue to research and that was when I decided to found my own company and produce more research and develop my own brand and kind of look into how can the research advance the techniques, which I then utilize in my collaborations again?

Severin Matusek

So I'm also curious about the Black Panther collaboration, because I think this is the biggest and most impactful work that you've done, that you've got very well known for. You designed a lot of the costumes. How did that happen? It's the way how you tell the story. I had this image in my head where, you know, if I think about fashion and production techniques. I think throughout history there is of course, this tradition that in certain places certain crafts emerge, and certain techniques. Then fashion houses go to specific people because they mastered that craft. So it sounds to me almost like your collaboration with Iris van Herpen, or with Black Panther, they come to you because they understand you mastered that craft, or you will work with that for 15 years. That's a skill and a knowledge that simply can't be replicated by someone in a day or something.So how did it happen with Black Panther?

Julia Koerner

Black Panther was very interesting because Ruth Carter had seen the designs I had made on the Haute Couture shows in Paris, and she was really interested in realizing something like this in the costumes for Black Panther. Ruth Carter is the Head of Costume Design of Black Panther at the Marvel productions. So she had seen the work at the Paris Haute Couture shows and was really interested to realize something 3D printed as part of the costume designs. So she reached out to me, because she saw that I'm an expert in the field, and she wanted to bring me on to work with her.

Back then I had never done a film before, never done costumes before and I've also had no idea who Ruth Carter was or what movie I'm actually working on because everything was totally under secret and non-disclosure agreements and top-secret code names and everything. So I started working on the project and was kind of curious. The codename was Motherland, I had no idea, that was like, an African film in the 70s and I was like, is this a remake? What is this gonna be? So I started working with her and a lot of time of the process of working with her went into explaining to her what materials are there? What techniques are there? What could we actually produce for this film? Then we did a lot of research into African patterns and kind of looked into traditional Zulu patterns and African Zulu hats, and also kind of drawings, African patterns. I then developed the first initial concept ideas, and was a back and forth process where she would kind of look at the design and say, let's change this and that and it was kind of a really great collaboration because we both learned a lot from each other. Then the actress was cast and I had to adapt the designs to the new sizes of the character and there the computational design came in really handy because I was able to just change the circumference of the head and all the design adapted to it automatically. So I didn't have to recreate everything once the character was cast.

Then I kind of put one and one together. I knew when the filming started, I knew who the actress was and I kind of figured out what movie I'm working on and still didn't really know what that meant, because I was a little bit into Marvel, but not that much. So I I didn't expect the impact of the film and then it was two months before the film came into the movie theaters, and it just had blew all the records of presale, all the tickets were sold out and I was like, ‘what is this?’, like, this is amazing. Then to kind of see what impact the film had on the black community and how it kind of affected the spirit and you saw little girls who all in a sudden could identify themselves with princesses because all of a sudden, there was a black princess in a superhero film. Was really, really amazing to see and also for me as a European kind of interesting to experience the American Black Culture and what kind of impact it had. Having been able to contribute to that was really exciting and seeing that Ruth Carter won, as the first African American woman, an Oscar in the costume category, was also really exciting because we kind of shared the success. She involved me in many interviews and kind of gave me a platform to talk about my work internationally and probably had more outreach than I ever could have dreamed of, because who goes to a Paris Haute Couture show? That's a very inclusive, small group of people who get to see that right? So everyone can go to the cinema and see a film or even watch it at home and so that was a very different kind of impact I expected and a really good experience.

Severin Matusek

I want to talk about your company and your current research and what you're interested in developing for the future. So I wonder, you told me, you work on a lot of sustainable designs right now and on your own first fashion collection trying to scale a little bit the individual designs that you've made - one off pieces until now - and trying to make collections out of it. How does it work? Where are you in that process? And what can we expect in the future?

Julia Koerner 22:27

So in 2015, I designed my first ready to wear collection where I collaborated with Stratasys, a 3D printing company here in the US to design The Sporophyte Collection and it was inspired by natural systems such as kelp, and funghi, and kind of patterns which I found in nature, and then 3D scanned and mimicked in the designs. It was merely to showcase what's possible with the technology.

Then in 2017, I designed the second collection, which was called the Iceland collection, in which I focused more on accessories and smaller scale applications. I also focused on how to combine the 3D printing elements with traditional methods such as sewing them on leather or other textiles and kind of figuring out how I can make it more accessible and reduce the price of the pieces and maybe go more into a series. I sold a few of those pieces, to private clients and to museums but also, for example, Google acquired some for a new app that they had developed, which was a kind of augmented reality app where you can go and shop your piece virtually, which was kind of a cool application. Following the Iceland collection over the last four years, I have focused more and more on new innovations like the textile printing, so printing in multicolor, on textiles without using any color dyes, no water and showcasing pieces which kind of are very organic and move with the body because of the relationship of the textile and the print.

At the same time I looked more into plant-based materials and so I'm right now developing a clutch which is made out of plant-based material. It's printed with a liquid plant-based resin and the idea with this clutch is that everything including the hinge and the clasp and everything is printed out of the same material. Therefore, it becomes much more sustainable in its production way but often, if you ever want to recycle, it isn't made out of five different materials and also, the idea of this kind of local production, on-demand, customized, personalized products, is something I want to realize with this first product. also look more towards home decor and kind of applications, which are products, which you can use at home. For the pandemic, I saw

that a lot of people spent more time at home, and are interested to kind of have more things around themselves at home.

So that is something I'm also kind of currently looking at developing further and always with keeping in mind the sustainable aspect of the additive manufacturing, the kind of no waste production and on-demand, localized, and kind of knowing what goes into the product.

Severin Matusek

Sustainability in fashion is a huge topic for many brands and companies worldwide as more and more consumers demand that from companies. Do you think that 3D printing in fashion will go out of its niche and become mass culture? Like, can I go to H&M and Zara and Primark in the future and buy a 3D printed garment with this? Will this be a future that we will see?

Julia Koerner

This is my favourite question. I get this over the last 15 years in every interview and I'm saying I'm not an oracle. I cannot predict the future, what it is, but I definitely see the impact of it, what it already has. I see fashion brands right now already looking at 3D printing and shoes and accessories and I see it coming in the future with mass production as well. It is a matter of costs, because 3D printing is still a rather expensive technology but as the demand will increase and as the fashion industry will have to look at alternative methods of production, I do see a future in it, definitely. My wish would be that there would be more attention to it. As you said at the beginning there is very little people who actually understand what 3D printing means. And I recently had a friend of mine, who works for NASA, come to my studio and he works with 3D printing since many years and he said he never really understood what 3D printing in fashion could do. He visited my studio and he looked at the things and he was like, ‘now I really understand what it is and what impact it can have. And so my personal wish would be that it got a lot of attention, it got a lot of hype, in all of the collaborations I did. I remember when I was working with Iris in 2014, one of the dresses was showcased in the National Geographic next to a 3D printed ear and a 3d printed NASA suit but I don't think that there was ever a publication which really kind of reach the broad audience and make them understand what the impact of this could be or like make them understand of how that actually works and I only see now, especially in the sports industry, companies starting to look at this, in the activewear more and more. I'm surprised it is so slow because there's really a lot of potential and I really hope that more

people are going to work with these techniques and implement it in the future because I just see so much potential in it.

Severin Matusek

Do you think that technologies like 3D printing can bring us closer to nature in a way I think we often have in our head this distinction that technology is somehow opposed to nature, because technology is manmade, and it's very cold and machines. We don't associate nature necessarily with technology but the way you describe 3D printing and natural materials and your research it actually sounds like this kind of 3D printing can get us closer to nature because we can mimic nature in a better way than we could do without technology. What do you think?

Julia Koerner

I think that the beauty in nature is that most of the elements they grow out of the same material. So when you look at the flower, for example, or a plant, everything grows out of the same material, and the plant grows harder and stiffer where it needs to be more structural and it can have really soft and beautiful colours and leaves in other places of its structure. So it grows out of the same material and that is something really beautiful, which I think in anything, which what we humans have produced, are rarely able to mimic because everything is always a composite of multiple materials. If you look at the chair or table, it's always made out of multiple different materials and rarely, there are designs, which you find, which don't use any adhesives, which don't use any screws, which don't use any kind of other elements, which put it together, which are produced in different areas of the world, shipped all together to be assembled and then shipped, again, to one location.

So if you look at how a car is produced, or how our chair is produced, or anything which kind of surrounds you, the impact of what the manufacturing of it is. What you're talking about is this very kind of non-natural way of, of growth, a non-natural way of something being put together. It’s the impact of all the shipping around the globe is really bad for our climate and, and for our situation. What I think what we can learn and where I think the 3D printing with the plant-based material can get us that we can kind of mimic something which is grown naturally, we can mimic it by growing it, I use the word growing it, with a machine. So when I'm talking about the clutch, what I design, and thinking that it's made out of plant-based material, the kind of analogy of something being grown is very close, right? Are you using a machine to kind of make it and then where the hinge is it becomes stiffer, where the clasp is it's bit more flexible. And so you can kind of integrate material properties with one single material.

Then there are also machines which do multi-material printing already. So you can kind of make a shoe sole, which is soft at one end and hard at another end and so I do agree with you that that 3D printing kind of brings us closer to natural processes, because we can all in a sudden imagine that we can grow things with machines similarly how nature does it.