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Unknown Speaker

KTM connecting for positive change

Duncan

Welcome to this new series of podcasts about designing metamaterials, we have created the series to explore how metamaterials are designed and how design can make use of metamaterials. This podcast is an initiative from the Metamaterials Innovation Network, a community funded by KTM. The Innovation Network aims to develop and showcase applications for metamaterials building, a community of academics, industry stakeholders, and investors and make these technologies more commercially accessible to markets. If you haven't already, go check out the KTM page, you can connect with our community, find the latest news take part in our events or funding opportunities, and much more. You can find the link in the description of this podcast. I'm Duncan Foster Fitzsimons, I'm a product designer, engineer and founder of Seventh Product Design Studio. Today I'll be talking with Anne Toomey, head of textiles programme at the Royal College of Art. Anne is a textile specialist with national and international experience in research based design, product development, manufacture and student centred education. As a design researcher her work questions and challenges the role of new materials and fabrication technologies in design for the 21st century. As head of textiles programme at the Royal College of Art, Anne Toomey leads a team of experts, specialist staff and over 130 postgraduate students working at the creative interface between materials making and meaning. Their focus is innovation that impacts and spans across many sectors, exploring new territories for the 21st century textile specialist. So, Anne, hello. You mentioned before to me that there's a challenge sometimes to communicate to people that textiles are so much more than cloth, clothing and soft furnishings. When I was a student at the RCA all of my flatmates were on the textiles course. And straightaway, that was a huge eye opener for me that there was this whole enormous area of materials manufacturer development and craft that I knew nothing about coming from a mechanical engineering background. So I'm going to start with a deliberately stupid question for you. What are textiles?

Anne

Hi, Duncan. Well, textiles is a broad discipline, as you know, with many facets of focus and practice. And I think the breadth and complexity of the discipline is frequently overlooked, and it is often associated with the domestic and with frocks, cushions and curtains. But textiles impacts almost every aspect of our lives. And it does offer uniquely fluid, flexible, and infinitely adaptable ways of questioning, examining and solving some of the increasingly complex societal challenges of the 21st century. We can shape them in almost infinite ways to band rap, fold, cover, mould grow and stretch. In order to adapt to our needs, we can modify their properties on the nano scale to engineer specific outcomes. They are simultaneously benign and familiar, and yet also incredibly complex and surprising. And their potential is only as limited as our imaginations. If we look at the complexity of their micro and macro structures, we can begin to comprehend the potential from fibre upwards. I always like to quote Veronica Capsali here, she says that there are more orders of hierarchical structure in your underwear than in the Eiffel Tower. And by this she means

that the first order in textiles being fibre, followed by yarn, then knit, and then the garment, whereas the Eiffel Tower is a third order structure. So this capability to influence behaviour and characteristics at each hierarchical stage offers a very intriguing space. And this is why we're interested in nanoscale opportunities that can create macroscale impact. This has deliberately influenced our thinking at Textiles LCA, and is behind the formation of our Soft Systems Research Group. Soft Systems is an approach that we use to question the current and future materiality of our lives and our individual and collective relationships they're in. Essentially, it is an approach that recognises the complexities of our material world and our relationship with it, and uses this as a platform for exploration and innovation. In organisational management, Checkland's soft systems methodology has been used for over 30 years. In the analysis of complex situations, where diverse viewpoints are held across diverse stakeholders, and the problem is undefined, this methodology recognises flux as the state of being and cautions against the solidification of parts of that flux, as situations, problems or issues. Within the group, we rethink materials and fabrication processes to discover new applications. It is this constant act of decoding and recoding that helps us to think of these new applications as soft textile systems with purpose that range from the functional to the poetic, right. So

Duncan

What you're saying here about hierarchies, I find really interesting because in, in solid materials, quite often you're looking at one or two layers of hierarchy, you might have a solid material with a coating, or you might have a composite made of one or two layers. But here, what we're talking about is underlying materials, then there's intermediate hierarchies of say threads, which are combined to make larger threads, which are then combined to make all sorts of different types of three dimensional structures. And then those structures themselves can be layered and interwoven to create other materials on top. So it seems that there's an enormous amount of room in this space for deliberate design of new materials with specific functions. And so your sort of area of research. This feels like it's a prime area of metamaterials. Can you talk me through some examples of smart materials that you've seen recently, or that you're really excited about?

Anne

Indeed, and I think you make a very good point about the hierarchy because often people look at textiles as a single entity, and as the product itself. But if you unpick that if you literally forensically take it apart, there are all these different layers where one can intervene. And what we've been doing within the group is to look further down into the smallest scale for new interventions that we can look at. And we've covered quite a lot of ground with graphene. And along with other 2d materials, it's of particular interest to us because of its myriad properties, which we're all very familiar with; atomic thickness, mobility, strength, toughness, etc, etc. The question, of course, for us is, you know, what does it mean for textiles, and for us, graphene was of interest because we saw potential for the material to take many forms, such as filaments and coatings. And this would enable this integration with textiles, and particularly if we take that hierarchical thinking, and in turn, this would then enable the creation of multifunctional textile based systems. Another attraction for us was the role that graphene could play within the electronic textiles field for wearable tech, and e-textiles face challenges with environmental and resources use because they are heavily based on the integration of valuable metals. And of course, this can cause

metal contamination in textile recycling streams. So our experiences with the disposal of contemporary electronic waste give us the reason to expect both environmental and social impact with regard to the recycling disposal of E textiles, and graphene offers a more sustainable approach in this field. Within our group, our researcher Elif Ozden Yanigun has carried out very promising work developing a graphene based platform for textiles, that includes filaments and coatings; we can also look at the nano scale to help with other environmental problems created by the textiles industry such as colour. And I'd like to give the example of Sarah Robertson; Sarah is our tutor for soft systems, and she has worked with Elif in collaboration with Ahu Gumrah Parry's group at Manchester, on using structural colour with textiles. And structural colour does not rely on pigments and water and is far more environmentally friendly. So the challenge is how to tune the colour at scale for the complex patterns and colour combinations that we so readily associate with textiles.

Duncan

This is really interesting. And I'm sort of always in my mind, I'm sort of can't help but sort of compare how these things might be developed compared with what I know best in sort of everyday product development. And so can you tell me a little bit about the development process you see with these materials? For example, is it technology push or market pull? Do people always start with a problem that they're trying to solve? And then develop a new material to solve that? Or do you find that your research is creating new material attributes which you know, then you can go and sort of say what can we use this for, what could be done with this new behaviour or new structure?

Anne

Well, I think at Textiles RCA, we tend to go with the latter of that and we use an approach called thinking through making, and practice-led research is fundamental. It's an intellectual framework for how we develop textiles and materials. We conceive and create this by thinking through making, and we uncover new insights through that material exploration. So we focus on radical experimentation, material exploration and transformation. And we encourage a nonlinear approach that sort of embraces conceptual thinking, a little bit of magical thinking and allows space for incidental and accidental processes of discovery. And when we find that when using this discovery approach in adjacency to other approaches, such as problem solving, we find that we can expand our knowledge base a bit more rapidly. And essentially, we were questioning the notion that all design starts with an identified or fixed problem. And this, of course, brings in the relevancy of Checkland's soft systems methodology, we find that we often revisit craft based approaches to assist in this discovery of material qualities. And we've used a bricolage approach to construction that can include traditional basketry and knitting alongside basic electronics. We took this approach when working with Imperial College on the FAIR-SPACE project. FAIR-SPACE was a large consortium working on future artificial intelligence and robotics for space. Within this, we contributed some work to the inner suit. And at the moment, we're working with Istanbul's Museum of Modern Art on a project called Crafting Technology for Textiles. And we're using craft techniques to explore new possibilities for textiles offered by emerging technologies. And within this, we've held a series of workshops and talks, and all of these can be found on the museum's website.

Duncan

I think that's fantastic. I think there's this there's a certain sort of opportunities for new ideas, which can only come out of hands on experimentation and play. And it's fantastic to hear that that approach can work with these sorts of materials, because as an outsider, one imagines that some of it is, you know, has to be, you know, very sort of theory driven. And so, you know, to hear that it can be craft basis is fantastic, because, you know, that that seems to, to me that it would open up an enormous amount of extra room for new innovation. Is textiles an area where you see a lot of ideas spinning out into new products and new startup businesses?

Anne

Indeed, and there are a lot of startups that are using very innovative ideas that are originating in textiles research, however these startup companies aren't necessarily textile practitioners. So it's really interesting to see how aspects of textiles are being adopted by by others. For example, OpenCell is an exciting collaborative space for biodesign and science in Shepherds Bush, and OpenCell supports this London ecosystem of designers and scientists who are incorporating biological techniques into material development. On the spaces is composed of sort of modular mixed use areas, which include labs, studios and workshops, and they use shipping containers, about 45 of them, adjacent to Shepherds Bush market. And here you'll find international designers and startups showcasing cutting edge ideas that will shape our futures and projects and break the boundaries between biology, design and technology. And OpenCell was co-founded by the highly imaginative duo of Thomas Meany and Helen Steiner, with backgrounds in nano electronics design and biotechnology. The group aim to make biotech accessible and understandable.

Duncan

It seems like industrial textile manufacture is already very well set up for multi structure, multi material approach. Do you think this means that textiles is kind of the ideal industry to be focusing on smart materials and metamaterials?

Anne

Well, there are certainly opportunities. And in an ideal world, there'd be some joined up thinking to explore this but the textile supply chain is global and incredibly complex. And that makes this very challenging. You know, perhaps vertical companies have a better edge here. Also, the vast majority of textile production is about high volume and high throughput. And there are always challenges associated with halting production lines to try something new. But I do have a lovely example that I can give you and that is again, Sarah Robertson, our tutor for soft systems at the RCA and her business partner Sarah Taylor, have created a beautiful woven optical product called Lit Lace. And this light emitting lace is a newly developed modular lighting system. It's being used in sort of heavy bits. Very big scale. It's used in in sort of theatre environments that comprises woven, optical fibre cloth and a bespoke selvage edge illuminator. And the scope of this particular project was to provide an opportunity for innovation through collaboration. And they worked with MYB Textiles, who are an internationally renowned weaver of madras, and lace shears, panels and blankets based in Ayrshire and Scotland, and they've been going since 1900. So, the aim was to develop these light emitting laser products using the optical fibre. And this was to allow strategic investment into new market roots. So the research was conducted on site at the mill and through design and prototyping and testing, the group worked collectively on

building the knowledge base required to create these pieces. There was previously no precedent for manufacturing smart textile products within a traditional textile manufacturing infrastructure in Scotland. It's important to note here that the looms used are 12 metres wide. And the technical challenge of weaving the fibre optic lace at this scale without flaw is truly tremendous. And it really is an endorsement of the superb skill of the weavers at MYB.

Duncan

It's amazing to see that you know that their, obviously their expertise, which is you know, it goes all the way back to 1900 can then be sort of applied to such a new material such as fibre optics. So, yeah, that's absolutely fascinating. It feels like as in a lot of areas of metamaterials, that a great next step would be to bring together materials development, manufacturing, design, product companies, all around some sort of shared vision. And that communication is going to be key in getting some of these amazing new materials out into market in products and sort of impacting on people's lives. Do you think perhaps that design has an important role here, in helping create these shared visions that everyone can kind of work towards together? It starts to get a little bit into the era of scenario building, like the work of Dunne & Raby perhaps?

Anne

There is certainly an appetite for this. Efforts to bring this to fruition have been in place for some time. For example, MADE the Materials and Design Exchange was created in 2005 for this specific purpose. The materials and design exchange, of course, is a nonprofit partnership. And it exists to encourage a better understanding and collaboration between designers, makers, and material scientists in order to stimulate innovation. But I think that identifying and developing a shared vision is key in collaboration. And there's often a need to overcome language barriers. And by that I mean subject specific vocabulary, and also methods of working and communication. designers will often use a visual or material language to communicate and express ideas, and scientists will use data graphs and diagrams. So understanding these differences requires an investment in time and effort, but it will yield dividends. With regards to scenarios, you know, the scenario method has been used by many sectors to help envisage a future possibility for invention. And I think it's best described as a creative exercise of storytelling, and it helps us to explore what might be possible or desirable and to find what does not yet exist. I've used this method successfully in inter-disciplinary international workshops, and a particular workshop in Japan comes to mind where we use speculative scenarios within the group to generate new ideas for chirimen silk. Chirimen silk is a traditional ancient kimono fabric. So this approach involved taking a materials led approach and decoupling the specialist self from the context of the kimono. And in looking at chirimen as a material rather than a product, we uncovered new possibilities through this decoding of the materiality, and the recoding of this extraordinary and special silk for new ventures in healthcare. As touched on earlier, not all design starts with a problem to solve. And designers have a role in asking questions too, just as much as providing solutions. Pioneered by Dunne & Raby, speculative design is about using design as a tool to create not only things but also ideas to speculate about possible futures. This method really pushes the imagination and is very valuable in challenging boundaries. Perhaps when we're looking at such new and unfamiliar territory, such as metamaterials, we need to initially embrace more questions than answers.

Duncan

Well, thank you so much Anne for taking the time to talk with me today and thank you all for listening. We hope you enjoyed this discussion and that it's helped open up this fascinating world of new developments in textiles and soft materials. As someone who works every day in the world of rigid materials, I feel there is an enormous amount here that I can learn and make use of, and that this is the area of materials really to keep an eye on where some of the most truly life changing opportunities are going to appear first. You can follow our podcast channel on Podbean and don't forget to visit our website in the description, where you can register to the newsletter to receive news and updates and take part in our community. See you next time.

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