

Interview no: 1

CM: Um...do, do....how much time do you have?

█: Errr.....35 minutes....is that enough?

CM: Yeah, it should be, yeah I will just try and....prioritise different questions then...

█: Er, I mean if we need more time I can...

CM: OK, but I will shoot for that anyway..... Are you still in █?

█: Yes, yes....still in █

CM: Amazing

█ Well there are no direct flights yet and there is still this two week quarantine for anyone flying from overseas so...It's very hard to.....er..... travel, but er.....the British government is announcing on the 29th what they are going to do.....about this.....

[sound of █ typing on a keyboard]

CM: Yes, it's still a bit difficult I guess. OK, so..... what I wanted to start with was, um.....was.....just by you perhaps telling me a little bit about yourself and your educational and professional er... background and then how these have led to your current research and lines of work?

█ Ummm....

[sound of typing]

one second....

[sound of typing]

I was just emailing my next call that I might be a bit late.....

CM: Oh sorry.....

█ Ok so, you want to talk about what is my educational and academic background and how this led me to where I am now, to this type of research?

CM: Yeah!

█ [REDACTED]

CM: And this was at █?

█ No this was at █....

CM: Ah, ok sorry.....

[REDACTED]

CM: Well how did you come to be involved in the Fairspace project specifically?

[REDACTED] Er.....so at first I was kind of involved in the EPSRC [REDACTED] project, that was running when I joined and then I joined from the beginning the smart systems for surgery project.....and then [REDACTED] got involved in the RAS network and *I think through that* Fairspace came to be, if I understand correctly, I don't know the details and [REDACTED] believed that some of the work I was doing in previous projects could also be applied for the Fairspace project, um.....so he had some ideas, [REDACTED] and...he steered me towards his ideas to work on specific applications within the Fairspace project, so..... before that I was doing a lot of wearables and implantables and sensors and....umm.....he believed this work on wearables and flexible, stretchable materials and devices would be applied for the inner suit of the Astronaut.....

CM: Ok..... so your role has mostly been on these flexible sensors for direct body contact?

[REDACTED] Yes.... in the past few years yeah, I mean at the same time I work on other projects and other technologies but one of main activities has been on that yes.....

CM: Ok, and then in terms of collaboration between electrical engineering or mechanical engineering and design, do you have any initial or.....kind of overall thoughts on why these types of projects might be helpful in that area?

[REDACTED] So the collaboration between *engineering and?*

CM: Design

■ Design...ok yes well, engineers...I mean to some extent it's kind of similar, when we discussed the collaboration between civil engineers and architects, ummmmm, I mean a civil engineer can make a robust building that will withstand earthquakes and fulfil its purpose.....but its not going to be pretty, er...so an architect comes in and looks at how a building can be integrated within its environment and fulfils its purpose but also ...make it more, apart from, make it pretty and also make it more functional and more suited to the user....so electronics and design, *it's the same thing*, engineers can make something that works, fulfils its primary goal but then there is all this criteria regarding the *end user* and the device and you want to make this more user friendly, er.....more functional, in terms of not only fulfilling its primary role and use but also make it....er..... integrate better into the lifestyle and daily use of the device, so.....it can help the interaction between the end user and the device lets say...so if you make something *more pretty* or...if its, if the designer helps to integrate the device more with other stuff...it adds value.....

CM: Ok yeah yeah....and what do you think that the involvement of RCA researchers and alumni has brought to.....brought to.....the Fairspace project at Imperial?

■ You mean the involvement of senior people with younger people?

CM: Just like the involvement of RCA, whether or not it's the students on the student project or the researchers, or the staff who have been engaged in interactions, what do you think the RCA involvement has brought to the Fairspace project....I mean it could be to Imperial staff or researchers in terms of, yeah....it's quite an open question really, but what do you think that the involvement has brought to the Fairspace project?

■ I think....er....er.....it has brought stuff on multiple levels, er.....so one thing would be er.....a completely different point of view which is always welcome and helpful...er....engineers think in a certain way and artists or designers think in a completely different way and this always helps um....and erm..... I think that's the main thing, um.....*what can I say?* The other thing is.....erm..... I mean also working together with someone that comes from a completely different background has positives as well because of completely different experiences and.... um...yeah completely different point of view to stuff generally, not just on the work but...so that's also refreshing in a working environment..... to work with people that are completely different to you and they way they see things generally so that was....that's nice.....em

CM: And then what do you think about the other way around? What do you think that Imperial, you know the Fairspace project has brought to RCA researchers and?

■ Um, perhaps the more technical aspects, um.....maybe introducing RCA people into advanced technologies, materials or engineering aspects so.....yeah I think there was a lot of *interaction* and everyone has gained from each others expertise, I mean for us, specifically with working with you for example, I have *no idea* about different techniques of embedding stuff into textiles, so I can remember at some point I asked you to explain to me, what is knitting, what is that and that was something *I learned from you for example*, that was very useful

CM: OK and then what do you think that these kinds of interactions *both ways* would have brought specifically to the Fairspace project, do you think that there is a tangible value there?

■ Yeah, yeah specifically, with ■'s project, I think there will be significant tangible outputs from this collaboration, he's working with two, and I think before, even three people working with

him on this project from RCA, for a long time and I think that that interaction has worked quite well and I think they are continuing with this work and there is definitely going to be something *useful* out of that, and you and me, if we continue to collaborate, I don't know how it's going to happen, but er, for sure, there's no way I can integrate stuff into textiles, or.....and um....yeah.....

CM: Ok so the next thing I wanted to ask you about was um.....er.....can you tell me a little about how your brief, if you would call it a brief, or your objectives for thermoregulation for the body, how they um, were developed.....so how they evolved out of an initial interest ... or whatever, how do you kind of develop your brief?

■ My what? My?

CM: Your brief, I don't know if you call it a brief, you know, your project objective to work with thermoregulation.....on the body, how did this kind of brief emerge? Or your objective for the project?

■ How does it emerge???? From what?

CM: Yes, from what exactly! I think I'm asking it in a strange way, like for example, the goal.....your overarching goal to work on thermo-regulation..... on the body with these flexible devices, how does the, or how did the initial goal to work on this aspect, develop?

■ Ah ok, this came completely from ■■■■■, he was at an international conference and came across some of the work of some other people that he thoughtttt er.... would be a good match for this project and that it also matched quite well with the stuff that I had been doing and he told me that we will have to do something like that for this project so..... it came from ■■■■■ not from me.....

CM: OK and do you think that it is a novel area to be working in, from the research you have been doing so far?

■ Yeah, yeah, it's a completely different application and it was quite refreshing to look into that because it was something completely new for me and it kind of fit, it was a good fit with the other stuff I had been doing and so it felt natural to work on that stuff as well and um..... yeah yeah it's something very interesting and I want to go on in pursuing that direction, cos yeah, its very nice.....

CM: And when you were working on that kind of thing, in what ways are you working on it, which kind of methods are you using in your research? It could be processes of making but also more desk based research?

■ Ummm, it's a combination of the two, I mean research is always a combination of the two, you need first to be able to understand the problem and er.....look at the state of the art so that involves desk work looking at the literature and *reading* and having completed that you then you can go hands on to do something and er...and er.....otherwise if you don't do that you are reinventing the wheel or you are not addressing the questions or the problems that others have had.....and it's not really research and you are just doing something..... so it's important to have a good understanding of the state of the art and understand the problem

CM: Ok yeah so is that something that you generally do, that's generally the way that you always approach the project that you are working on?

■ Yes *always*, I've seen people operating the other way, here's a problem and let's do it and they either end up doing something that's not novel or interesting, just something that kind of

works or doing something that's *completely wrong*. I saw that recently, people did not understand the problem, hadn't read any papers and just did stuff that in the end were rubbish and was a complete waste of time, they couldn't understand what the need is.....

CM: Ok, yeah. So the next question is around like the material outputs that have been developed throughout the time that I've spent at Imperial, so I'm talking specifically about the material outputs that I have worked on and maybe some of the ones that you have worked on as well....and I guess I want to ask you, if you were to look at these outputs, straight without much other contextual awareness, would you think that there is an evidence of collaboration within the artefacts.....? Are the different skill sets evident?

■: Emmmmm...yeah, *unfortunately* for our example it didn't manage to progress much because of the corona virus because it terminated early and also you were staying at Imperial for a very short time, but *yes*, we have a book chapter that is an output from our collaboration, we have some preliminary prototype of testing different tubings into prototypes so there is some progress there, *for sure*. Of course, for ■'s project since he had a larger team of people who worked for a longer time with him he has more concrete evidence of this fruitful collaboration between the two institutes.....

CM: But if you were to talk about in what ways it is evident in samples of the different inputs..... would you talk about it, in which ways do you think it is evident that there has been a collaborative?

■:.....um, I don't know how to answer that, could you give me some examples?

CM: Like for example..... I'm thinking about the textile samples and thinking if you were to look at them and think about in what ways there has been input from engineering or input from Imperial researchers, which aspects of the samples would you think, um..... are

■: Yes, *for sure*, for our work for example, you were trying to see what is the best way to integrate these tubings into the textiles based on the textile integrating techniques available.....and er...we were collaborating and discussing *what's good* and *what's not good*, so it's something that we were doing together, you were *providing feedback* and I was *providing feedback*, you were explaining things to me which I had no idea about, these methods and you created some prototypes and I came back at you and said for example this is *not suitable we need something else, the channels might collapse or there's too much, it's too rigid or not that flexible, let's do this type of design or that*, so, *yes there was a lot of discussions interactions that er was leading to progress.....*

CM: So the last question I have on that is do you think that this type of collaboration is similar to anything that you have previously worked on?

■: I.....I.....have *never* worked on anything with textiles and integration so that is something completely new for me and I know *nothing* about it. I also have never worked again, with a textile person or a fashion.....I don't know how would you describe yourself?

CM: Yes, I would probably describe myself as a textile designer.....

■: Yeah so I have never had this experience before, working with this type of skills and background so that was definitely something refreshing and very interesting.....

CM: Have you worked with someone from design before?

■: No, no..... *never*

CM: OK, yeah...

█: I mean the interaction, I gave a lecture, I don't think you were there, as part of the degree they have.....

CM: No, I wasn't there

█: So, at the RCA, that was a *very nice experience*, I also participated in the crits of the student projects at the RCA, so that was very interesting, and *inspiring* actually.... I was actually very impressed to see that people there were working on materials and more scientific work, um....I thought it was more of abstract fashion or art but it was design aspects using new technologies addressing the actual needs of people in terms of wearable stuff so that was *super interesting* and I was *very impressed* by that and it was a *very rewarding experience for me*

CM: Yes I am sure it was very valuable to have your input, I mean I didn't see it, but it's interesting because I guess that was a part of the Fairspace project, I mean much earlier....but.....So the next question I wanted to ask you about is the physical site for collaboration so this could involve actually your interaction at the RCA, but do you think that the physical working environment where the collaboration took place influenced the type of work that was being produced?

█: Er, the environment, sooo..... you mean, being at Imperial? Um....I mean, it was certainly very..... convenient for me that you were there and we were meeting, we were in same office..... it certainly helped things, in terms of a matter of convenience and....er..... it was easy.... we had different materials, we could order new materials there, if you needed there was all the equipment that we had so...in terms of the engineering progress and the communication it was convenient and *useful* to be co-located at Imperial and also RCA *was not far away*, and you were free to move around and use the facilities there....um I don't know is this what you mean?

CM: Yes, would you have liked to see more of the work that was going on at RCA or....I mean.... I also understand that you are working on some other projects, but do you feel that that kind of aspect of it was *fulfilled*? I mean in terms of collaborating across the two institutions, do you think it is necessary to be within the two host institutions orr..... it was OK the way that it was?

█: *Um....I mean the two institutes are very close to each other....so people do not need to be host at another, it's not necessary, because they are so close, but it does certainly help to do that, er.....I know.....ummmmm.....yeah don't know what else to say....*

CM: Yeah, ok so the next question is further reflection but I was wondering if you might be able to do a visual exercise... if you have a pen and paper, then I'll ask you to send it to me....I haven't got the video on now

█

█: Ok...yeah I got something

CM: OK, if you thought about this process as a *map or a landscape*, would you be able to sketch your own journey within this process

█: Let me get a pen, I found a paper....one second, sorry.....ok so you want me to draw something about my journey?

CM: yeah, so if you think about this research process as a map or a landscape, this is a visual metaphor of the collaboration and then if you have that, then think about your own journey within the project, this could be....um..... drawn however you want, you could think about your journey as a *line* or..... however you want. You could think about the *site*

of your research, it might be a quick sketch of where you do your research, it is open ended but the idea is that it is a quick visual exercise...

■ Specific to Fairspace collaboration?

CM: Yes specific to Fairspace and our collaboration...

■:

[drawing]

CM: How's it going?

■: *I'm trying...*[laughter]

....

[Drawing]

[Sound of pen drawing]

Yeah....I don't know how good that is....

CM: It will be *fine*! It's just a way to begin to think of things in a visual way. I can't see it, perhaps you can take a picture and send it to me

■ Yeah, yeah, that's what I'm doing...

CM: What...what... have you sketched?

■ Just a path with arrows showing different steps and processes.....I don't know if it's what you wanted, OK done...so.... I've just sent it to you.....

CM: It's very open...so it....

....

[opening the file]

...

OK, it says, what does it say at the beginning? Reality?

■:Errrr.... reading

CM: Reading, sorry, ok. Calls to companies?

■ Calls to companies and quotations.....electronics, sensors and CAD design...

CM: OK, *yeah yeah yeah*...

■: Device assembly, testing and *verification*

CM: And then Covid-19?

■: and then around that point *you came in* and focused on textile integration and then I went to a conference....

CM: Which conference was that? The one where you presented your paper?

■: Yes *that* conference paper, yeah, you saw that one.....

CM: Ok yeah and then covid- *thank you* so much that's *really* helpful. That's *really* helpful. So the next thing I want to do quickly...can I share my screen with you.....

█: Oh at the beginning, I didn't finish that sorry....it wasn't that evident....so at the beginning there is me...that humanoid drawing...

CM: [chuckles] Ok, at the beginning, yes, I can see it a little bit....

█: [speaking with a smile] then I had an arrow *going up* and then *an arrow going down* and that was █ steering me into that project

CM: Ok so you were going somewhere else first.... so were you thankful for that steering?

█: Yeah *yeah* for sure!

Continues after image.....

CM: Ok, so I am going to share something with you now, *can you see my screen?*

█: Yeah, I can, yeah....one second.....

CM: OK so this is.....a diagram that shows...um.... some different ways of working in collaboration with others, and obviously, the first one...well hopefully they are quite self explanatory, the first one is intradisciplinary working within a single discipline and the second one is multidisciplinary, is kind ofwhere the middle point might represent the problem and there are different people working on the problem but from within their own discipline, so like *methods*, or whatever else won't have changed too much from what they are used to working in, and then cross disciplinary everyone is still working in their own discipline but they are working *a little bit closer*, looking over each others shoulders, much more aware of what the other is working, being able to see the perspective of another and then interdisciplinary where things are much more mixed, methods may be shared, knowledge is *really integrated*, a real synthesis of approaches and then transdisciplinary where perhaps actually the work and the methods is transcending beyond either of the individual methods and perhaps becoming a new discipline of its own, its own *thing*....so I was wondering, if you were to look at these, I was wondering *in which ways* do you think you have worked during the fairspace collaboration, *specifically?*

█: So in terms of *our collaboration*, we were at that point uh, working in a cross-disciplinary fashion, but with the potential of *future steps* being more interdisciplinary and we're going towards that direction and the potential output of all of that could be something that is *more transdisciplinary*.....

CM: OK yeah that's great

█: But yeah, as long as we worked together we are at a cross-disciplinary stage

CM: Ok, so I am just going to stop sharing.....ok so do you think if you were....with hindsight, what might be things that um.... you would have done, or would have liked to have been done in a slightly different way....?

█: Ummmmm.....

CM: It could be in terms of approach or anything

█: The problem is that I work on *multiple projects* and I cannot concentrate 100% on a project....to have the.....progress that I would have liked to have, so I have been working on many projects at the same time and everything progresses slowly...emmm.....it would have been nice if I could dedicate 100% of my time on this specific project.....*ummm*....other than that I think that's it.....

CM: and what would you say, anything....maybe you addressed it earlier on but is there anything particularly successful or.....less so?

█: Successful, you mean? Ah I didn't hear.... OK yea, I think our project was *nice* and I think it has been progressing nicely, I mean it would be nice if we could continue working *I don't know how it's going to happen*, to produce something out of it, we need to see how it can happen, but it would be nice to do that....and um....I think that's it....There are *nice ideas* and there was some good progress and there is some potential to do *some very nice stuff*.....

[sound of █ typing]

CM: mm....do you think with this type of research between your own field of research and textile design or more broadly between the type of sciences you are working in and the larger field of design theres are any broader implications for this type of research and what type of implications do you think that those might be?

█: This type of cross-disciplinary collaboration?

CM: Yeah

█: I mean it would certainly has the potential to create something that is more user-friendly and more practical for the end user, *for sure*, something that, considering this outside of the Fairspace sphere, for daily use...could be something that's more appealing to the end user to use ...because sometimes the big problem with many technologies is that they can be *fascinating and amazing* but they cannot be adopted by the end users because *it doesn't look good or its not suitable to be used all the time or it's something that creates stigma*, if it is something too obvious, like this guy is using this device, he has a problem and all this type of thing, so if you create something not....so if you *treat a problem with this type of technology its not just um...functionality*, like it has to do *this and that*, but it can also help the user, *use it more or integrate more with his lifestyle or make it more unobstructive* for his daily routines and lifestyles then this new technology will be adopted more by people, they will be made more appealing, so....that's where the designer comes in to help that, to *facilitate this* and also an interesting, *important* thing, it's also to design with the end user *not just for the end user*, so I believe potential end user should also be part of this ecosystem, *so that's the engineer, with the designer and let's say the patient*, they can tell stuff they can to steer stuff, the design to... for even better outcomes

CM: So more human-centred methods?

█: Yes, yeah...

CM: So my last question is what do you think the implications are *beyond the object*, when working in this way, and *beyond the designed objects, beyond the technology?* Do you have any thoughts about why these types of collaborations might be important *beyond what is made?*

█: *Beyond?*

CM: Yeah

█: *Beyond what sorry?*

CM: *Beyond what is made...beyond any physical designed technology or output?*

█: Ummm...what do you mean?

CM: Um...well I guess I am wondering, do you think this type of collaboration are important for other reasons than to create these objects that would be useful for a patient.. or...

█: I mean, collaboration with people with different professional experience but also cultural backgrounds it's always rewarding..... it allows other people to obtain a different point of view, to understand any problems more or from a different perspective and it creates a more.....valuable, more interesting working environment just practically, It make it more fun lets say, to work with people from different backgrounds because we learn *new things all the time* whether its *working mentality or cultural stuff*, of course I'm not only talking about, culture can have many different meanings....I'm █ but designers and fashion designers have a totally different culture, so not just uhhh...so that's always *very rewarding* and always, the interaction with people with different skills involves also..... skills transfer, so.....people acquire *new skills and knowledge* so that is always powerful because then these people can then pick up these *new methods, techniques, ideas* and exploit them in their own field of expertise and that can potentially lead to new synergies or new..... paradigms.....

CM: And do you think these are necessary now, these new ways of doing things?

█: *Yeah yeah yeah*, this is becoming increasingly important and necessary

CM: and why do you think that is?

█: If you consider the history of science, you know, things start being very discreet but as technology evolves and..... as the real life application becomes more evident then you know.....different skills are required to put something together, to make something new. Once upon a time people where polymaths...but er....

CM: They were what?

█: They were capable of working in many different disciplines.....

CM: Oh ok....yeah

█: polymaths...but uh...with the growth of knowledge exponentially growing.....over the past few decades this is no longer possible so we need people with expertise in many different skills.....

CM: OK yeah

█ So if you look at 17th or 18th century scientists.... they made *considerable* significant contributions in multiple scientific fields that were not really related to each other but this is no longer possible, you need someone that is dedicated to a specific field of expertise.....

CM: Do you think that is something that has been lost? Or something.....that....

█: Its inevitable.... because of the amount of growth of knowledge in this field....its not possible to know everything, even for a respected field.... so I'm an electronics engineer focusing on.... analogue micro electronics.....but.....people can be..... signal processing engineer and *know nothing* about electric circuits, you know everybody gets a niche in their field, it's not possible to know everything *there is not enough time*...there is too much stuff to know.....

CM: Yeah yeah OK, that's really helpful █, thank you for all of your insightful answers and for taking the time to....

█: Its ok, thank you for chatting with me a bit earlier....is there anything else you need

CM: No, you already sent me your drawing, so that's everything....yeah that should be everything

█: If you need anymore clarification just let me know, we can chat again

CM: Ok yeah, well thank you, I'll talk to you soon, have a wonderful day

█: Thank you, have a good day.

[REDACTED]

[REDACTED]

CM: Ok.... well that leads on really nicely onto these other questions I had for you, but I wanted to ask you about... what you think that.... involvement of RCA researchers, either alumni or students or researchers, involved in the Imperial project, um, the FairSPACE imperial project, what do you think that they...er.....what do you think that they brought to the project...um.. and the work?

█: Ooh what do I *think* they brought or what was my vision onboarding them?

CM: Both, it could be both, actually, you know expectations *before*, um...and also if that changed throughout?

█: Yeah, so the way I've articulated it to █ and the FairSPACE project is that I think that the Designers are bringing in...bringing the TRL *up*, so the technology readiness level, er, on the basis that engineers, like I've already experienced in my industrial experience, engineers are very good at making things that work, but that does not mean making things that people want to use. Does your thing work, *yes 100%*, *but*, what happens if your user is finding it clunky and they're just like I don't want to use it.... So it doesn't matter how beautiful it works....unless somebody else could *relate* and use it....then it doesn't really go anywhere, so there's no adoption. In that sense. And so I think that was how I've articulated it, I've sort of put you on a graph and say like this is how each of them would improve the TRL level [laughter] of each of the projects that is going around, um...yeah, so that is sort of how I've done it. And I

guess, like maybe.....part of your work is also articulated in your independent ...er....statement of work or errrr.... contract, I mean sometimes I have to make that look like... like its an Imperial contract, I don't know if you notice, haha, there is analytical competency and this other competency, but it was interesting for me, when I filled that in [laughter] I was like *what counts* as analytical and numerical? HMMMM, um, so in a way some of that is also folded in... the way your statement of work or contract is...is...set up. Although I didn't explicitly said to youuuu, as the statement of work, any of the statements didn't say, 'your job is to improve the TRL', *because* I think that is *my...er....speculation*, in a way, that is like, sort of in a way, *what I think* they will do and this is how I am sort of hypothesising and pitching it to people forum....*trying*, but I think whether it does or it doesn't.....I wanted *both* of your skills, like both of the engineers and the the textile designers skills to sort of *really* come through, so you remember that bit when I said I am sort of that bit in the middle, that wants to....you know that wants to not be any of the white blocks, or not be any of the blocks....so I think that's what I said when I meant when I said I wanted *both* discipline to just do their best and see what happens right,

CM: So do you think.....sorry, carry on....

█:instead of, you are here to do what I think you were going to do, it's like, what if you think that isn't the case, you just do whatever.... anyway, so you just whatever is the best for.....whatever you see is the best for the project and we'll see if it improves the TRL Level.

CM: So do you feel it is very much connected at the product level

█: I think there is product and there is process.... Because *of course* there is a product level thing, um and I think the product at the end of the day is *used* by people, and I think it's kind of really bazaar to talk about wearables without textile designers in the mix....ummm.... I mean it's a *wearable*, it's a piece of textile.... [laughter].... I think that sort of came to me, that whole thing about wearable doesn't work *without textiles* came to me when █

█.....because back then I was still █
█, um and for me, I think *luckily for me*, █
and because if you remember my first wearable project was with a fashion designer, so I was actually looking for a fashion designer for my wearables work and so I think this is actually the case with.....this project as well, so.....before we got to you guys, textile designers, I actually had to spend *quite a bit*.....of effort trying to explain different types of designers, so they thought they wanted someone who makes garments..... and so I said OK..... that's probably a fashion designer if you are talking about pattern cutting and all that.....but if you are talking about making flexible substrates then we are talking about *textiles designers*, and if you are then talking about the silicon thingy that, like, I don't know helps you to stop things from moving and shifting.....that is *trimming* and other things, is a totally different kind of company.....and so in a way, because I have gone through that process in learning those different bits in █
█, I felt like then I can better explain this, in the project and then also get people to understand it, but I think that *wasn't easy* for people to understand different kind of discipline, *why* a textile designer, but once it's there, it's just kind of *moves*, I think, like, once people understood, ok we aren't looking for other things, like this that or the other, just looking for a textile designer, then it.....it...yeahh

CM: Yeah, Ok then if we were to put it around the other way, what do you think that Imperial brought to the development of RCA researchers, students, alumni and their work....what..... what would you imagine?

█: I think it's a different way, a different of *working*, so again, it's a kind of strange thing, I think both discipline has a product focus but you both just focus on different aspect of the product, I would say and *both* are necessary and complimentary and must go hand in hand in my opinion.....for a wearable product, it's like you are talking about a wearable product, you...you can't do one without the other, and I thought imperial brought an entirely different process.....so I think, Im saying this because █

█ I think the process is very different, in Royal College of Art you are *very free* to do your line of investigation.....and you follow your line of investigation, in *Imperial* █ but then you had a specific product you had to make, like there is a thing that you have to make that *is working*, and the definition of *working* is very *clear*, which is you turn it on and it does what you say in your spec..... Um.....whereas, with design it's *not quite that*, and I think by working together maybe you see a bit of each others world...ummm..... and learn how the other person works and I think a lot of it is *communication to be honest*, so it's that white bit that I'm in, that white space, negative space bit that I'm in, where I think I facilitate that discussion until it then works and then I disappear from that piece of work because then you are filling in that white space yourself, so then I find another space to to..... fill.....or to bridge, um, so yeahI thinks that's..... I feel like that's probably what Imperial is bringing to RCA, is, is a sort of..... maybe a different type of structure of approaching things, it is a structure, it's not just a process, but is is quite a fixed....thing I think.

CM: So I think maybe you've kind of already covered this, but in terms of like, about how these briefs or projects that are being worked on, like how, how, do you see that they evolve or come into being, um, I mean you've talked about like how, like, this idea of like they... you know, its very structured, but where do you think the kind of brief is coming from, I mean I know you've said at RCA there's specific lines of inquiry that you are free to do and one is very structured so how do you think at Imperial these briefs are developed?

█: You mean like by the engineers themselves, how do they start with that brief?

CM: Yeah, or just a kind of like wider, even like the Fairspace project....like having specific goals within Imperial and then Imperial engineers developing the brief....um....from your experience how do you see that process to be working?

█: Um.....this time is without relationship to the RCA? It's just Imperial on its own

CM: Yeah it could be beginning with Imperial, or it could be how it worked with imperial and RCA, whatever you think when I talk about that?

█: Yeah I think I covered the RCA bit how it started at the beginning, um.... I guess one thing I would add to that is that a lot of it is admin [laughter] I think as a sort of *in-between*, I don't know, I think I just have to be not afraid of admin work [laughter] in that sense, it does get things going. I think I heard this thing that said there are two things that stop people doing things, one is fear and the other is admin [laughter] so yeah, I think that's.....

CM: [laughter]....I totally agree with that

█: [laughter]...yeah, so I think that that's the only other thing I would say is that innovation is that innovation is not just about all about those *glittery, beautiful* things, it's also about all of those admin work, that is so unglamorous but has to be done.....and then, I think, like..... how this whole thing works, because the Fairspace project is very much focused on *industry impact* and so therefore, your role here is partly.... to improve that *industry impact*, I mean *mostly* [laughter]..... I guess like industry impact takes many forms....and...thats... so I guess that is kind of investigation of what I'm looking atfrom my perspective of being in negative space..... in white space element.....and so for *me* I just thought that *basically* it would be helpful to have textile designers in wearable projects, and just sort of really think about what people would do, would wear, *how people would feel* about these things, and design it, like make the product work from ground up *that way*, so not sort of crowbarring in a sort of oh user perspective in or that sort of thing or crowbarring in the comfort aspect later on.... it was like we are going to make you wear these braces that you don't want to wear for two seconds, no, no.....we don't start with that we want to start with something that people want to wear throughout the thing.....Um, so yeah, I think.....sorry..... I probably just rambled on.....

CM: No, no...so yeah, earlier you were talking about this um, you know I asked you if your expectations had changed and you talked about how there was a vision and then how in actuality these two things were, can you talk to me more about that really....?

█: about?

CM: About your initial vision for bringing these designers in and how you feel it was *in actuality*?

█: Yeah, in actuality, I guess I'm still learning and doing these interview things, it's actually going to be an exercise, a fun one, so, *anyways* I'm still trying to *understand*, I think from my perspective, I'm finding it interesting because I guess my line of work is always a bit.....contradictory.....like in one way I want to bring people together and in another way.....I want to get out of peoples face.. [laughter] like I just want to let things happen, so in that sense sometimes I think that's what I find most difficult in all of my roles as █ even in my previous roles is that I would like to set things up but also I want to get out of people's way. So then I feel like it's a very hard balance to make, between getting out of the way.....and trying to learn about the process..... So I feel like *by nature*, if I start prodding, or like pushing or like kind of *putting in ideas*, then I'm sort of like really getting in the way of the collaboration and the collaborators that were set up to do that collaboration.....So I think, I guess if I have a wish I would say I wish I would have asked people or like keep track of that *sort of evolution of innovation a little bit better*, or at least know them a little bit better without *getting in the way*, but I think most of the time, I think it is personality as well, I have opted for just getting out of the way and just like I would *rather* let you get on for 6 months and then do an interview at the end as pose to having a weekly meeting with you *every week* and going, Claire, *what did you do?* █, *what did you do?* And I just don't think I could do that.....

CM: Yeah well.....I guess it's as you say it's all like a learning process isn't it, like figuring out what works and, like, yeah, I guess do you think what you've seen of physical outputs.....do you think these are demonstrative of kind of these two different ... er....domains or disciplines, er... .come together, I mean this could be in the work I've been involved in or the work that █ and █, do you feel like it's in the physical

materials this....this....um, these people that you've been a part of bringing together is really evident in, if you were to look at the work?

■: Yeah ! I mean, *absolutely*, I don't think, um that like the engineering researchers themselves would have come up with the work, um....from the visual output, it wouldn't, I don't think they would have come up with the work themselves, um, yeah because they would have *gone about it a different way* right they would have found an existing product and tried to *stitch or strap or stick* whatever, the electronic devices on..... as a pose to really trying to integrate them.....So.... I think *for sure*, the idea of sort ofidea of.....*joining things together from the ground up* is quite evident from.....er....from the *look* of the product, if I could call it the *product*, because product is a very strange word in research.....in a way because I guess coming from industry..... the product is a fully functioning *thing*..... yeah that *does a thing*, um.....whereas, I feel like a thing, the...*the product... the prototype as it is*, is more like a demo..... of the future, so its never really quite finished..... which I mean it should be like that.....if its finished it should be in industry, um.....so yeah it's a bit hard, for meit's a bit hard to see if that will *stick or stay*, like.....*beyond* your collaboration, so like this is one of the things that..... I would be sort of coming back to the researchers on later on....later on in the year, like with the technical team and sort of see..... whether some of the things er.....stayed.....um and whether that sort of*sparks* a change of approach....in... in *both* parties, um....I think thats kind of important.... I think a collaboration is *not really neutral*, I mean, I think if you are learning something then *naturally* you would change your mind at some point or change your way.... or change your ideas at some point.....

CM: So you mean by neutrality....? Like you mean in terms of like you wouldn't go into something without coming out unchanged, or?

■: Yeah, but I guess this is like, again.... I need to see....like I think one way I would see is to again look into that *outcome* of the product, but I guess there is this bit of process, that is really hard to *measure or understand*, which is the bit that I was saying to you, I wish that I would have been there more *frequently*, it wasn't that being there more frequently allowed me to see the product, like more resolution of product development but it was that when you are there, if I am there more frequently, maybe I can then see how the *process* or how the kind of thinkingwould have evolved. Er.....*but yeah*, I think that is harder for me to gauge whether people are more then.....er..... more lets say from the imperial perspective, whether people are more like *user-*or like comfort focused, I mean comfort is not a word, right in technical research I don't think, or it is very low priority word.....um and I be curious, equally curious as to whether RCA researchers have found the process useful.....Because I think there is a pace thing as well..... they work at very different pace, um, I'm sort of thinking it could be quite stressful at times....but [laughter] haha. But yeah I would be curious to know if that was helpful kind of stress or not helpful kind of stress....

CM: Um, ok so I guess we are already kind of reflecting but you have mentioned you potentially would sort of like to think about or have been more involved in this process element to kind of understand how the project was developing for those involved.... um so I guess I'm wondering if you can think about, in your mind.....what has been really a success, you know *so far*, because as you say, like, it is is something that is never totally finished and is *ongoing*, so what do you consider a success?

■: I think a success is when..... the researcher has *improved* their way of working together, like across the discipline, so that *process* thing.

CM: The both of them, together?

■: Both of them, so, so *working better together*. You know that bit where I was saying if you were two blocks and I'm that white space, negative space in the middle that you have sort of come to merge, *a little bit more*, so that my space would shrink, that's my definition of success

CM: OK

■: So that I have, um, less to bridge, that you are more able to see each others' perspective, not that you will *become* the expert of....of.... the others discipline but you are more able to *articulate or communicate* in....in.... the other work, I think that would be a success. Er, obviously, the other success I would say is an improved, er, ah, level of *technology readiness*, but anyways the word has a lot of problem, like technology readiness, is talking about technology readiness [laughter] is not talking about er, I guess um, user- and anything else like.....*and anyways*, but is the readiness of this product. So I think an improvement in that would be a great success, er but.... I'm finding it hard to measure.....so, er my..... I guess my line of investigation because if I were to say OK... the designers would improve the TRL level, then it is also my job to *find a metrics* that would make that claim.....so yeah I guess that's kind of where I'm.... I guess what I'm looking for, how do I *then measure* this er thing, this TRL level improvement.....

CM: And is that an expected part of your role or is that something that you feel is necessary for yourself?

■: Ummmm.....I think it is a responsibility that I have taken on the moment when I have pitched the idea that that's what the designers will do *for you*. [laughter]....you know.... I'm like if I hadn't *pitched that idea* then its not, it's probably an interesting thing, but since I have pitched the idea and that was the basis like that people were like oh that's an *interesting idea* like to see that, aha, but then it is now my *responsibility and duty* to follow through.....and actually say well....this is what happened and I can *quantify* to you that it *does or does not* work. Um.....so yeah that's sort of where it is.....I'm think... I'm *struggling* to explain whether there is a *huge success* with the collaboration at this point..... I mean, um for *me*, it is a success judging from the way *you were working*, and you were kind of like, the product was *kind of more wearable*, I don't know how to explain it but it's just more *wearable*, um but I couldn't quite say whether it improves the TRL level..... Um, and I think the other thing is I haven't seen.....This is the other thing that I find difficult, so..... I haven't really seen the details of your work.... especially I guess in....um..... ■'s case, because he has a lot of secrets, so..... I don't see *the work sometimes*

CM: yeah so it's hard to understand down to the details from this kind of larger, process, strategy and then right down to the specifics....

■: Yeah, its very hard to.... because innovation is very *specific* I think, innovation is not like, er, we've just invented this new idea, *ideas are cheap* as far as entrepreneurs are concerned, what is *really truly* innovation, and if we look at it from a perspective....of....I guess of er, a *patentable thing*, it is very specific, it is not a generic thing, you can't patent, like oh this is this idea of doing this, nobody is going to write a patent on that, the *patent is written on the specific* of *how that thing did a thing*, so I think that by *not being able to see that*, it makes my job very difficult in a way.....like I couldn't say.....I couldn't say....whether its successful *or not*, so that's this thing

that I'm *learning*.....*which is* ...its like how do I do that, how do I explain and prove that there *is a novelty, a value*, an improved technology level, *that this is definitely a thing that is happening*, without being able to see the details.....?

CM: Yeah, totally....

■: And so I think that's probably really why I'm struggling to *articulate*.....er.....whether I felt I felt there's a success that has been met, um.....and I *guess* I will see some of this in the conversation that we will have and also in the conversation we will have and also the conversation I had and I guess I do that with both sides, I'm *sorry* at this point I just don't think I can answer that question, maybe I could come back to it?

CM: No, yes! OK what about on the flip side, what do you think are the things that are less successful, or are these all.....um, or what are your thoughts to that?

■: MMMM.....What would be less successful *in that collaboration?*

CM: Yeah, I mean it doesn't have to be specific to either of the projects it could be in the kind of the *wider* idea of bringing textile designers into the Fairspace project or in some of the other projects, or some of the specific projects, what *type of thing* might you consider to be *less successful?*

■: That is an interesting question, *because*.....you know we emphasise failures a lot...you know.....*that's the way you learn, you learn by failing*, so I feel like there isn't, of course a lot of prototypes don't work..... a lot of things took a detour....you know, *I do not consider them a failure*. I think what is not successful is when you had to take a detour..... *and you didn't manage to reflect on it*. Um, ideally again..... I would *love to part of that journey*, and go like ok well you reflected on it and you let me know and therefore I know that this is changing the process and therefore I could also tick *this meta design of the design of the TRL level thing*, er, I could do that, but then again, I feel like that is slightly secondary to.....um the research output maybe, maybe not.....maybe that's where I'm doing it wrong because this project is very much about improving technology readiness, maybe the *success* is not with the work between the designers and the engineer but a bit of my work that I've not seen the things *enough* to know.....but then *hopefully* I get a chance to correct it and it becomes a learning point as a pose to a not success..... So I think that with success, you can't really tell when your *not successful*, whether there are things that are not successful *until the end of something*

CM: I guess I'm wondering like, what do you think that..... *beyond* Fairspace, *beyond* RCA and Imperial collaboration, or using that as an example.... but what do you think the kind of broader implications of this type of research has the power to do... if we talk about, what do you think is the importance of doing this kind of work, I know you talked about the wearability and the TRL, but I guess I'm wondering if you think there is something *beyond* that, um?

■: Beyond the two things?

CM: Well..... do you think there are broader implications beyond say this specific project.... product in *this specific context*, are these types of collaborations serving.....um....other purposes, beyond just working on a single *product*, from your point of view or do you have any thoughts on that idea?

■: Ummmm....yeah yeah yeah, I see what you mean.....um, yeah I guess like ultimately, it is like about *collaboration and participation*, *true* participation, not just talkanistic ones, and I think, so I've always recognised that collaboration and participation *is hard*, um, people say it and they

don't do it most of the time, when they say they are collaborating, it meant *we had a few chats* as opposed to we did some real work, so..... I think that's the kind of broader implication is that I guess.....*ultimately* this is one way of realising a participatory collaborative work,..... um, I don't know seeing a slightly less.....I don't want to say.....*maybe*, we'll say....in a way then we are.....kind of just not only making technology *because we can*.....but making technology, um, for things..... I don't know, *for things*.....um I don't know, it's hard, actually that's harsh.....I don't want to say that actually....I will say that maybe textile designers *ground* engineering research, in a way, in a different way to maybe how engineering research grounds textiles work, and so yeah..... I think this participation thing, it's balanced it's not like one thing taking, or like removing or adding to the other, it is a mesh. I'm just finding it *really hard to explain* it because word only goes in one direction in time, because you have to start somewhere and end somewhere but it's actually a parallel process that *these two things come together* and I think it is the coming together of two things that has implications for the society at large, its this thing where you always build the two things from the ground up, *like together*, as oppose to build this one thing, this textiles or engineering and then sort of add on the later aspects.....it's just a *totally different* way of doing things and I think.....I think..... I mean, I guess in entrepreneurship.....prototype has a very different meaning..... prototype is.....if you've seen this diagram of prototyping, I think it starts with a skateboard, two wheels and a board and it goes to I don't know.... a.....um.....what do you call those things, the one with one handle bar and like, what do you call those things?

CM: scooter....?

█: *Scooter exactly*, and then it's the scooter, and then it's the bike and then the motor bike and the car. At every stage of this prototyping process, you have a self contained thing.....that is, like....I guess like in my mind, I would like to see that in every stage of the process this self contained thing is made by the two, *by both discipline together*, and I think I'm pointing out that each of them is a *working* thing, because I think that working thing only happens when the two disciplines joins together to do it, *otherwise* you have wheels on one hand and like, I don't know..... skateboard top service, *on the other*, and they are just two components of one thing, whereas I think this approach is very different in a way where always from the ground up *be not separate*

CM: Yeah, I guess you spoke earlier about grounds, were you talking about this idea of the ground up? You said textile design grounds engineering in a separate way to engineering grounding textiles? So would you be able to tell me a little bit more about what you meant by that?

█: Yeah, so like I guess what I meant is like.....um..... in both research process, its very easy to get lost, *it's just the way it is* because if your in your own world thinking about your own thing all the time, then every idea is kind of like a good idea.....and you sort of like grow on them.....*But* when you have a totally different discipline and a different perspective, who is also still interested in ultimately in this thing working.....so we are not talking about a different discipline where..... you are not specifically interested in making this thing functional thing....then its different, *but* both textiles and in █ case, electronics engineering, *is about making this thing work*, so I think in a way what I'm saying, when I say grounding.....I meant, when you see the other person floating away in the grounding you get the other person like, *wait but I need that other thing*, so then you sort of have to reevaluate, right so it's totally different

right, it's a totally different way of thinking, it's a totally different.....need for *the thing to do a thing*, right, so yeah, right basically, it probably would hold each other *back* in a way.....um, to a position of making this thing technology ready in a way....haha, so yeah, I think that's what I meant.....when I say.....there is a grounding done..... in both, from both sides. Its *perspective*, its *mindset* its *process*, its *technology*, the two things got brought together to make this skateboard.....as a pose to the two things just flow to the way, in an *unjointed* way and then later on have to do a lot of work to have to kind of bring back the skateboard.

CM: Thank you, so I guess I'm also interested in this idea of grounding, do you also think that the physical site of say the collaboration and the work being taken place, the collaborative work, largely going on at Imperial.....how do you, how do you think that might have played a role in you know, how the work..... moves along, do you have any thoughts on that?

█: I think um, being in a different place, places people in a different *mindset*, the fact that the work takes place at Imperial has *undoubtedly* forced the designers to adjust more to the engineers than the engineers to adjust more to the designers..... I think.....um..... and so it's not just a place, I think that the culture is hosted within a place. When you are in.....er..... a different place you also get to see the culture, the norms, and *everything that is sort of right*, or *correct*, or *success* in that particular environment and so I think.... that by hosting it at imperial it undoubtedly have, I mean, I think you can tell me later, but I think it has sort of pushed the designer closer to the technical research than to push the technical research closer to the RCA.....um....which I guess is █ So hosting in█ at....in... RCA, imperial researchers go there and work with RCA people, that's sort of a..... different side of these things....um..... but I think I'm really really glad that the workshops were sorted out...at some point.....it sort of got confusing at others, but I think the workshops is really what helped the designers to stay designerly..... because I guess I always have to tell this to engineers *in a way* because I guess I am *more* engineer at this moment. Is that I always have to say to people, *look, there are different ways of knowings* and the fact that designers knows ways in a non mathematical model does not negate, er, their knowing, they just know in a different way, so just work with it, as opposed to thinking, I could do this better if I mathematically model it.....Its *no, no*, that's not necessarily not more accurate, so I think there is this thing, um, maybe that's what it is.... in the engineering, there is this thing about *accuracy, repeatability*, but yeah so I feel like by being hosted at Imperial, you are sort of, sort of a little bit forced to be a little bit more er, *engineeringy than designerly*, but I hope, er, the RCA workshops availability has sort of gave that design ability, designerly aspect a bit of a breathing space, so return designer.....yeah!

CM: Yeah, definitely. Um, you talk about the culture of, you know the culture being hosted in a place? What do you, kind of, what do you mean exactly by that?

█: Ummm..... a place, I guess, I mean it's kind of strange, it's in a way of structure.....but also in a way of *people*, because a building is quite unusually empty apart from the COVID days but even *then* I would have thought walking into the Hamlyn Centre *in Covid times and walking into the RCA Stevens building in COVID times, itself* just tells you a different story right. Right we do things *in straight lines, in organised blocks, innnnn* with a bit of er, sort of shiny surfaces and all that vs in the RCA, *it's a bit like how do I get up to 3rd floor on this room with three different buildings that is joined together, but sort of every where is like a gallery space* and so you find little surprises everywhere at the RCA. Whereas in Imperial you just know the Library is

there, it's a very different thing, just than the *building itself*, just makes you go *ok ok, I get it*, I need to walk straight, i'll do that. And I think the people as well, *the way the people dress, the way the people walk, the way the people talk, the way people explain to you what they would like to do*, I think it's very clear that the two different cultures, um, are not the same.....and the concerns are not the same, so you are not concerned about the same thing.....so I think that's what I meant when I say in the building it hosts different culture, *the building itself, the people themselves, the moment you get in its very hard* to be not that.....like not to be that, but like to be entirely abstracted, like *unrelated*, you sort of have to in a way, relate and therefore like you just kind of *blend in* as a pose..... to like, you see what I mean?

CM: You blend into the place that you go, you mean? Yes that's super interesting, OK well I'm now going to ask you, similarly to how you asked us in the previous thing, a little um.....like metaphorical visual question, but I was hoping, if you could draw me a small map.....of yourself, well, where you position yourself within this project.....so it could be different areas, or different materials, or different disciplines.... I think you've described it actually, um.....quite.....well.

█: Yeah I think I have that negative space

CM: Well, if you wouldn't mind thinking of it as a map.....

█: Yeah, er, what do you need in a map, specifically?

CM: So it could be, if I were to say to you like a map of um, of this project you've been involved in, it could be bringing together textile designers and engineers, it could be RCA/ Imperial, it could be the material....er....specifics the technicalities as the solution architect, whatever you feel to be the most prominent, um, you know metaphor that you think of when I talk about yourself.....on a map, and you know make sure to include yourself within it.

█: OK i'll do that , um.....hmmmm

[drawing and scratchy pencil on paper sounds]

.....

Ooh, I wonder if that would be correct? I'm gonna try this...but I don't know if that's exactly what I meant, I just had a really *strange* idea.....um.....

[drawing]

.....

[few minutes pass...]

Ummmm, *this is good*..... I'm saying this is good, so this is my.....um.....*do I want to do that?*

[both laughing]

Maybe I want to do one more actually..... Ok, I think this is my map

CM: OK can you hold it back a little bit, Okkkkk.....let me just seee.....I just took a picture, OK! so whats, what's.....can you tell me a little bit about it?

█: Soooooo....I guess this is imperial, a square block, with *more square blocks inside*, actually I want to draw *one more square block in side*, just layers of like *blocks* with people *on the ground*, kind of away.....and this is RCA..... with people *exploring the edges*, whatever, *sitting outside, sitting inside* and there is the bit of..... let's say Claire.... and █ *meeting* in the middle and I'm *just that bit of shadow*, negative space.....kind of..... but I just

didn't think shadow is right, because that means I am a part of you and [REDACTED]..... but I'm not kind of..... but I just wanted to be *a shade somewhere*

CM: Ok, great, and what about how you've put groups of people vs. individuals at RCA, is that anything?

[REDACTED]: Oh I hadn't thought about them in terms of *groups and individual*. When I first drawn them it was very much about the *density* of people at Imperial versus the density in RCA, but *obviously*, most people in Imperial are kind of like conforming to the same pose.

CM: Same what sorry?

[REDACTED]: And here at RCA people are some people are like sitting out there at the edge, sometimes floating around, sitting in the top and like there is all sorts of posture that one could do whereas here it is let's just all stand on the *ground floor of a block*, I'm sorry this is like..... extremely unfair..... and brutal to explain to Imperial..... it must not be named [laughter]

CM: OK yeah, don't worry

[REDACTED]: It felt like a bit like that.....in a way that it is very structured....

CM: alright [REDACTED], that is amazing, thanks so much, did you have anything else, any thoughts you want to share, or ...

[REDACTED]: No, um, I guess I have questions like.....on sort of where.....where..... is this research specifically..... I don't know if it's where is the research going to go, maybe it is a question that I will ask you later on.....Um.....do *I have any specific questions about this project*, yes..... I think I would like to..... I'd like to know more, about like, is this like investigation specifically about the building.....about the building..... the map, place.....actually I have to say to you the building thing is very much inspired by our talk about metaphorically the building, I probably would have drawn a very different kind of map..... had we not been talking about buildings.....

CM: Yeah we had been talking about the building, ok so what was your question, oh about my research? Well there's different layers to it really, because I'm interested in both the material outcomes, so collaboration within the material.....but then also I'm interested in you know the wider context that er.... either enable that or support that, so yeah I think place definitely plays some kind of role in that, it's not totally central to my inquiry.....but it is definitely an element that I'm interested in.....

[REDACTED]: MM, yeahh.....ok....cool

CM:Ok so we will chat again, yeah? what time did you want to do..... your?

[REDACTED]: Did you say 2pm?

CM: Well I mean to be honest I was just thinking after lunch, I normally have lunch around 1pm so I just thought 2pm, but if there is a time that works better for you, then just let me know.....

[REDACTED]: 2pm works fine, can we do 2pm?

CM: Yes of course! Thank you so much [REDACTED], that's been really, really helpful, it's been so good to get your insight.

[REDACTED]: it's been good to chat

CM: Ok....bye

[REDACTED]: thank you.....byeeee

Interview no: 3

CM: Well, so...what I am doing is using it for *my research*, each of the interviews that I do will be anonymised and so your name wouldn't be used, but I may use *elements* of, you know the conversation within the thesis, more to understand, you know...collaboration within design research through experiences within the FAIRSPACE project, so it's kind of talking about textile design collaborating with other disciplines, so I'm interested in... the types of challenges and the types of relationships and what is kind of necessary for these kind of relationships to take place, things like that so...

█: OK... fair enough

CM: So, I guess, um..the first thing I could ask you about is if you could tell me....is...just a little bit...if you could tell me a little bit about your background. Academic, professional, whatever you think in terms of like, what is relevant having brought you to the type of work that you are doing today?

█: Ok, so █
█
█
█
█
█
█

CM: Ok, do you have any specific values or beliefs that underpin or drive your research interests?

█: That's, I think that's what basically drove me more to kind of er, to not continue working in oil and gas.... it was like, I felt like there wasn't the need to add a certain amount of value, socially and etc.....whatever...

CM: Ah ok, so that's why you left?

█: That was one of the main reasons why I left, like..... the financial motive wasn't *that strong* for me and er, I felt like a technical and intellectual and social value had *more* importance, like from my perspective and that's what drove this, yeah.....

CM: Ok, yeah, and for example, your involvement in the Fairspace project *specifically*, how did you come to be involved in that?

█: So I think that Fairspace, so when I finished my Masters, █ wanted me to continue the project I was doing in my Masters, for my PhD as well but I wanted to....kind....of shift and work on exoskeletons and soft exoskeletons, because I think that could have a lot more *widespread* impact than surgical robotics. I was working in surgical robotics in my Masters and while surgery can affect 1 in 1,000 or something like that, um, when it comes to surgical robotics I think that the impact could be *way more*, and that was one of the things I thought of and why I wanted to shift my focus from er.....from.....like.... from surgical robotics and general medical robotics to like.....assistive robotics and when I started assistive robotics, there.....there is, was no grant associated with it and so █ was sort of self funding the project through his.....you know.... PhD funds and etc etc. and so basically he could easily see that there was er, like *a derth* of support, in that when you are not supported by a grant you find it more challenging *to buy stuff*, to set up experimental set ups and rigs and stuff like that and so when I

proposed to [REDACTED] that there could be an application of assistive robotics within the Fairspace project.... and [REDACTED] was, he had just.... then he catered, so he had *just won* the Fairspace grant and I said..... you know there is a *very good way* that we could, can incorporate the assistive robotics work into Fairspace and I think he took that into consideration and then he fine tuned his grant objectives along, partly along what I was doing...

CM: Ah ok, that's fascinating, yes I guess there is a lot of transferrable, if you are talking about you know back into the health sphere, in more like preventative, or whatever else...

[REDACTED]: *Exactly*, I agree, completely agree, yeah, you can, pretty much *all* of space research has translated into medical or other human interest based research after a while.....and so anything that is applicable in space from a human perspective can be tied to what we are doing...

CM: OK, and in terms of like the value in collaborating *between science and design*, I'm interested in your thoughts and what you think that involvement in the Fairspace project, based at Imperial, has brought to the development of RCA students, researchers, alumni and their work?

[REDACTED]: Ok, so I think for me, I think design....I think a lot of what we do is also design, I think design is like very broad in that sense, [REDACTED] designs electronics, I design mechanical hardware, you guys design, like, um....more textile based hardware and so I think like design is more broad in that sense *for me* and...for me what I thought.... how I felt the collaboration was extremely useful for me, was there was this whole realm of knowledge that I..... there's only so much that one person can learn and develop skills in a few years, theirs.....my strengths were more in the areas of mechanical design and understanding *the physics* of machinery and mechanics and stuff like that...but for example, when it came to translating that into more soft robotics and textile based fabrics and *stuff like that* I could easily see that I would, there's only so many papers that I could read to come up with the skill level at which RCA was, and so it was way more useful for me to get into collaboration and you know *ramp up* the learning curve than, and you know trying to because pretty much you know if you've seen it, *all* of Hamlyn Research students, we do not get a lot of direct technical support that we would get in the past, it was like everyone was *self learning*, you know, everyone was using google and google scholar and stuff like that, but you know there is a certain limitation to that...is that there is only so many papers one person can read there is only so much expertise so for example, for me in that case, it was *near impossible* for me to get an understanding of textiles and fabrics and the integration of multi materials etc that someone at RCA would have and so for me it made a lot of sense to set up this.....and you know be a part of this collaboration and to push for this collaboration.....

CM: Yeah, ok and then what do you think, how do you think it has er, changed or developed the skills or knowledge of the RCA researchers?

[REDACTED]: Er.....*I think*, I'm pretty sure, in the case of [REDACTED] and [REDACTED], with whom I have been predominantly working, I think they are *supremely* talented when it comes to their own domains and they are I think very receptive to learning other stuff, so they have been self learning to quite an extent and also they have been..... so I think, I've tried to make it my point, because I think for me, so I think there is a very stark difference in how..... er..... RCA students approach design and in how we approach design, for us the functional aspect is.....is.... predominantly most important, whereas the aesthetic impact is very important for the RCA students, whereas the functional aspect may take a bit of compromise, but like how it looks in pictures and videos and all this.... I have kind of found all of this out, I think for me it is like..... er, for me.....maybe

I've started taking into account, ok *some amount of aesthetics is important*, but I've also maybe tried to transfer that stuff to them, like, *no you need to think about functional stuff*, you need to think about *the forces* and *the stresses* and which point are the forces going to be experienced, *is this material going to work? can we integrate something else?* If some other material comes in, how is it going to interact with the skin, is it going to be *abrasive* or *is it gonna be?* So stuff like that, for me function is king so basically..... I think basically I think that's where a lot of our..... design philosophies kind of digress and so I think that's where.....we have to be most collaborative

CM: Ok, yeah and then um, do you think that the combination of these skills coming together has changed the evolution of what would be the input of this project for Fairspace?

█: Er.....

CM:..... Or how do you think it might have been different without the RCA input?

█: So.....*me* what I would have done, in my case.....er.....if I was to go at it alone, what I would have done is I would have brought a ready made jacket that was available..... I would have bought a *ready made* glove that was available, a *ready made elbow support sleeve* from, for rehab and physical therapy purposes, stuff like that, which are have been traditionally *very well made over time*, so its like you can get really high quality elbow supports or shoulder supports, *etc etc etc* and then integrate that into first getting a prototype to see even if the direction we are working in *is valid and viable* or do we have to make some changes there, whereas how I have seen RCA researchers approach it is, is like, they need to make *everything* from scratch. So like if you think about it, right now, █ is like on the verge of finishing *her gloves*, but I think, one thing I'm worried about is that we still don't know if its gonna..... *fail or work*, we spent close to 8 or 9 months on the gloves and we cannot still say when I pull the tendons and I apply the forces with the motors whether it's gonna *work or not*, and that's because we did not test it earlier with some *other much more easily manufactured stuff*, you know just use ready made gloves.... just use *ready made splints*, just use ready made supports so I think that's where I would have done it differently, but apart from that I think where, it's been a *big positive* it how I've got to learn different techniques on how they manufacture, what are the different you know manufacturing *styles* and how they think about like *darts* and like theres different stuff I've learnt like new materials like *power mesh* and how they researched into zero-ing in on power mesh in the first place, why not certain *other materials* and so there is a lot of stuff I have learnt, er but like the thing is like there is *always a sword hanging over my head*, whether like is that last 8 months of work, has it.... is it going to fractify in the next week or not, because *we have never tested it*. And I think that is where we digress between aesthetics and function..... you know, we have never tested it....so we can never be sure if it is going to work...

CM: So, the next thing I want to talk a little bit about methods of research and like the type of methods that you have been using in your research and if they are different to...

█: Also....can I just add to the previous comment, for example, say for example, █'s work, that project was a lot more *independent* because we were not, it *was just a very broad idea* that we had and it was just we wanted to create, we wanted to get away from the traditional marker based work and we wanted to come up with a new technique of doing it...and so we did not have *any* um, so we just had some *very broad specs* and so we were more open to some *very wild ideas* because we did not, so the functionality was not, *there was nothing touching it or*

pulling it or stuff like that, so. That kind of gave her a lot of freedom I would say, which *may* have made her work easier than what [REDACTED]'s work in the sense that [REDACTED]'s work had to withstand heavy forces, it's kind of like, you know if you play devil's advocates *for both their sides*, you know like, in, for [REDACTED] the challenge was more functional than the aesthetic and so it's more difficult for her to approach it and maybe maybe [REDACTED] had an easier work in the sense that she had something that was....like not going to be *pulled and pushed* and you know, so like the weaving idea did not work with hers, but the printing and the simple sticker based method *worked* and so that what was like, you know, sometimes the simpler solution is what is more.....is working better and so I think that is something I wanted to add.

CM: Yeah, yeah do you think it's anything to do with like, at the stage at which the project was at when they began working?

[REDACTED]: So you *have* to also take into consideration that for [REDACTED]'s project we already had a lot *more experience* in the sense that we were trying to give her that experience, like we know that is not going to work, we *already* had a prototype from London condo experts, the undergarment manufacturers that [REDACTED] had brought along earlier, so they had *made* a prototype and [REDACTED] had seen that prototype and like how we *pulled on it* and how we applied tendons and she saw that you know you cannot have something that is *super soft and not strong*, but you know you I think that it's very difficult for people to move away from *their design philosophies*, er, its very difficult unless you experience it first hand..... so I think in that case, maybe I am just hoping for the best that in the next month when we start testing [REDACTED]'s prototype, like *hopefully she can*, if something goes wrong she has all *the ideas in her mind* to compensate for that. That's what I'm hoping yeah.

CM: Yeah, yeah and do you think that these, like the materials or the outputs or the things that you have been working on, do you think that they.....reflect or visually represent the types of skills that have gone into making them?

[REDACTED]: *Oh definitely*, I think that it has been primarily, like..... for example, I wouldn't have imagined the glove as [REDACTED] would have imagined the gloves..... *and so* like the output is completely dependant on *the maker* and so at the end of the day I'm just like giving her like, ideas on *what is going to work* and *what is not going to work* and what you are supposed to experience and what and you know...and then *she kind of like*...you know, I have never been one to micromanage and I didn't want that because it was like they were *researching themselves*, *they were not employees*, so then it's *definitely* a reflection of [REDACTED]'s or [REDACTED]'s kind of interpretation of what the exo glove should be and so these played to her strengths to a certain extent I am guessing.

CM: OK yea, and then what about, do you think that.... this collaboration, is it different? Have you worked on something similar in the past, where you have been collaborating with disciplines that are apparently so different to your own or do you find them different? I mean I know at the beginning you said that you are both working on design but with different understandings of what design meant, but would you say this is kind of new for you?

[REDACTED]: *Oh definitely*, I think, er, in *hindsight*, one of the things that I would definitely had.....er, like started, because if you think about it, we *started* the project last July end, I think that's when they graduated, I think August if I am not wrong, when they graduated from their masters and *I'm pretty sure* like we could have *done better* if we both had some more experience, with, I

would say, in the....in maybe how, *engineers work with artists and how artists work with designers and stuff like that* and from that point I think it would have been *very important* to have, like a postdoc or something working above us, who had *sort of idea* on how both of them work, like I would have said, like, what I see for example, *someone in RCA would have been* ■■■, ■■■, I think has a lot of engineering understanding as well. So I think someone like that being *an intermediary*, er, in to kind of translating the requirements and the philosophy and understanding like, *Ok, is this taking too long or is this not taking time enough because...* and stuff like that because in hindsight I would have gone, had the project been done through.... *in that way*.

CM: Yeah, so those are like some of, it's almost like thrown in the deep end you just kind of figuring out things as you go. Yes, that makes sense.... So I guess, another question I had is do you think that your perception of textile design has changed through the collaboration or the type of approaches that might be used, or are used

■■■: Yes, I think I would love to see *some more*, I think there were a lot more ideas thrown about, but I don't think that we have enough time *now*, like there was talk about *auxetic* design structures, and stuff like that which I think could have had *a lot of impact* on our work but we are still trying to pull off *the first phase of the work*, but like we are still hoping like for however, so but yeah, *in the future*, definitely my.... like what I think about textile designers work etc, in the past.... *has definitely changed*, even in the case of like, another thing like.... the new project, so ■■■ *from the start* has been working on the exo-suit and the glove and ■■■, in the first half worked on the *wearable marker garment* and the second half she has been working on inflatable, er, *force.... er, suppression*, er you know, component for the exosuit, that would go to absorb forces and ...stuff like that and so I think that in that case, like, I think that these guys all have a *very broad skill-set* they were able to take their learning, like in the case of ■■■, she was able to take her learnings in traditional textile into other new materials, like materials she has not necessarily worked with, like....foams and rubbers and stuff....so she may have worked on fabrics and silicons before, but she kind of, like, just like how we research, I think she has *researched* and found her way with plastics and foams and rubbers and stuff like that, so like I think it's very cool for me to see they almost on the border of becoming like *material scientists* as well, you know, material engineers, not creating materials, but working with a combination of existing materials and stuff like that and so that's very cool to see and something new.....

CM: Then what about, a slightly different topic, but the actual *physical site*, for the collaboration to take place so for example, um, where you are *doing* the work or where they are *doing* the work, can you talk to me a little bit about the role, if any, the physical space has played in the outputs or final results.....

■■■: I think we were *very flexible* on the physical space as compared to like.... so for, like when I deal with the masters students I was supervising, I am supervising *right now*, they would work *on site*, like pretty much and so that gave *me the freedom* to just drop in on them anytime because like usually you don't get the ideas between one o'clock on a Tuesday or five o'clock on a Friday when you set meetings you know, you just get ideas and how to execute stuff like *any time* and so that gave me the freedom to just walk into their office or into their workspace, or whenever they had some trouble or some doubts etc. they would just walk into *my* office and we would sit and discuss and stuff like that, but I think with ■■■ and ■■■ it was a bit different in the sense that they er, I think, preferred having much more flexible times and *stuff* like that,

like they chose their own times to *come in and go* and work in Imperial and work at RCA and so *yea, so that was.....* so I think that we just, apart from *a specific time on a specific day*, when we chose to have regular update meetings, they would have *the flexibility* to either work from Imperial or er, work from RCA, or etc and yeah I'm pretty sure I think that they must have felt some sort of space constraints, er, I think that we have all faced some sort of amount of space constraints because [redacted] group *grew too big* we have lost some sort of space like [redacted] and stuff like that we have lost over the last year so a lot of people have *crammed, etc* so I'm guessing that was definitely a constraint, er, and I think we *all* had that problem, it is not only [redacted] and [redacted] who faced it, but I think the whole of [redacted] has faced that....there's very little space....er I think that was my feeling of space, from a space perspective of your question.....

CM: Ok, and then your personal, I mean you were based in another space and would then come together for meetings?

[redacted]: So I was sitting on the [redacted] floor they were sitting on the [redacted] floor and that's about *it*, so eh, but they would prefer to work *somewhere else* or *work from home* or *work at the RCA*, or stuff like that, you know work on the *computer at RCA*, etc etc. and I think like, when you're working....so I think one limitation that was really obvious was like I think *at times* they needed to work with certain design softwares, like adobe illustration and stuff like that so, being Imperial, we did not have college access to those softwares *whereas RCA had access* to that software so it definitely made sense for them to work from the RCA library or the computer lab and em ,then em. So yeah

CM: Ok so this is something I wanted to do as a small visual exercise so maybe this is something you can consider and send to me via email if that could be OK? I was thinking if you can consider the site of your research, um and if you could draw it as a map and if you want you could think about it metaphorically as a landscape, thinking about the site of your research, like where do you do your research?

[redacted]: Yeah, OK. You just want me to *draw that, is it?*

CM: Yeah

[redacted]: OK, then I can just draw my table, it's not something fancy?

CM: No, nothing fancy, just a quick sketch. Like as if you are thinking about your workspace, do you have one workspace, or if you have two workspaces are they close to one another?

[redacted]: Oh I just....have *one workspace*. Ok so this is another thing. So Fairspace is *very different* from the other grants. Like in the other grants, all the researchers, like 5 or 6 researchers are all working on *the same robot, the same project* whereas, in Fairspace everyone is working on a different part of the project, like *you guys were working on thermoregulation*, [redacted], [redacted] and I *were working on the exoskeletons-suit*, [redacted] and [redacted] *were working on the brain stuff*, [redacted] was working on the *Gait stuff and space monitoring*, so there were 5 sub projects, and so we did not have *a dedicated lab* and so everyone was, so therefore, like, the other projects like cat-board or we board, or micro robotics all had their own *dedicated* big labs and we never had that, so, that was again, I think something from a space perspective so basically

CM: That's unusual maybe, is it?

[redacted]: I'm just going to draw my

[quietly drawing]

CM: So that's unusual is it?

█: *Oh definitely*, it's very unusual as compared to all the other grants that you would see. Er, I'm just gonna, *can I share?*

CM: You can just photograph it....or

█: I'll just take a picture and i'll send it to you.....

CM: Ok, yeah, because I now, I was going to ask you, if you could, if you were thinking about the project as a whole on reflection to think about, if you then had this map that you had drawn like a physical landscape or little sketch diagram, or whatever it is.....

Oh ok, so.....is that your desk?

█: Yeah, that's basically my desk and the hashed area is the space for me to work on the hardware and the rest is my computer space.....

CM: Oh ok, amazing. I'm just going to try and *take*, can I take a picture, actually....so then the next sketch I wanted you to do was, so these are some visual research interview methods. The other one I wanted to ask you to draw was to, again think about your project as a landscape, your collaborative research and then think about it as a *journey*, so during the Fairspace project between textile design and engineering and then think *about somehow* differentiating between the moments you worked *with others* and then the moments you worked alone

█: Uhum!

CM: so you can do that in *any way* you want

RV: Like I didn't understand the question, could you repeat the question, I think it's *a bit more open-ended*.....

CM: Yeah, it's quite open ended. But to think about the project and reflecting on the project and your collaboration with █ and █ and between *textile design and engineering*, if you were to think about this as a type of *landscape or journey* and the *process as a journey* and then if you think about placing *yourself* on this landscape, perhaps you also place your collaborators and then just place points where you either worked together or alone, it could just be one point in the project, or however you interpret that one.

█: I think I would prefer to talk about it like that....rather than try to sketch something on a landscape, *is that OK with you?*

CM: Yeah, ok sure, of course.....

█: For me, the *main differentiating* factor about whether I was going to work alone or whether I was working in a collaboration would be, like if it was █'s project, *definitely I wouldn't have been able to do it*, or that bit of it, I would have outsourced it completely to a company and er, so like that would have been the first project, the wearable marker garment thing, and so in that case *her* project and mine...it was....her project was kind of the foundation for us to start working on something because I had already written a lot of code for the normal *marker*, the normal marker.....experiments and I was going to translate that and use it on her garment in the future, *but* her work did not depend on my work I could have always replaced her garment with the normal mo-con, motion tracking experiments and so her work was something, I don't think I could have ever done it myself and so that was the added benefit, *like a big bonus*, like if

that was compared with her second project, which is the inflatable force thing, I don't think I would have the time to do that *either*, so I would have just like....a very rough thing I would have done, is like just buy some *foam* or some sort of gel bags or *something like that* from some ready made shoe stores, or insoles or *eyepads* or something like that, some sort of squishy things and just stuck it underneath the exo-glove I would have made, but the thing that she would have made, but the thing that she is making custom I don't think in the limited four years that I would have had I could have achieved.... now coming to [REDACTED]'s project, how I would have done it and even how I was doing it before she came into the project was, like, as she was making *everything* from scratch, from like, taking the person's measurements, to designing the *whole pattern for the glove etc etc etc*. I would have....how I was doing it, I would just have, how I was doing it, I would have just bought a ready made elbow support, *a wrist brace, a glove, and stuff like that* and I stitched them all of together, even now I still work like that....

CM: So is this just to quickly test, to quickly test proof of concept?

[REDACTED]: Yeah, I would have just gone with that, like from the papers perspective, I would have....the physics perspective was more important than the design, than the aesthetics of the design

CM: Sorry did you say the *paper's perspective*?

[REDACTED]: Yeah the paper, the physics is more important, the paper is more important, how useful and stuff like that. It's not how it looks and stuff *like that* it's more like, how much assistance can the glove give, how much of a disabled person's weight can it support? That is what is *more important*, it is not important how does it look and is it like, stuff like that....you know and *definitely*, it would have been more suboptimal as compared to the more *optimised* design that [REDACTED] has, so in that case definitely, not having the collaboration we would not have been able to have *more of this*, you know, it would have been more generalised in that sense....it would have been *more rough* and I think that is where the whole value comes in from what [REDACTED] brings into the exoskeletons-suit project.

CM: Making it more um, more *complete*? More ready to be worn maybe?

[REDACTED]: I would say, more ready, more kind of, *fit for purpose*, more *subject specific*, I would say, that's the word I would use, more *subject specific than generic*....

CM: Subject specific?

[REDACTED]: yeah, you know in that sense, you know like so for example, if I was to buy a glove or elbow support or stuff like that, I can only buy an S, M, or an L or an XL. But every person is going to be *five types* of S, five types of M so in that case, but that is still something, in that case you know, that you would do *as a start up* and not as a *very early prototype*. You think about it, *in the earliest stages of design you want to see does your idea work or not?* You don't care as much about designing a bespoke suit or something, you just want to see does the suit *even come up*, you know....but yeah...so yeah....So that's, there's a pro and a con over there, so that's, yeah, and definitely, I think without [REDACTED] I would not have been able to do that whole *subject-specific design thing*, you know.

CM: So perhaps it changed in some way the course of the research that was going on

[REDACTED]: Actually, we are still working *separately*, like [REDACTED] is still not finished her part and so we are working separately now and we are hoping that from July onwards, we can start putting stuff together....

CM: Oh ok, yeah and it's probably *particularly* difficult at the moment because of the situation....

█: Definitely,

CM: Ok, so I was going to ask you about what do you think has been most successful and what has been less so, I mean you have touched on some of this already but if you had any other thoughts?

█: Like the suit and the glove, are still kind of there, if it's gonna be successful it's gonna be *hugely* good, it's gonna be *really good*, because er, but if not, we um, have very little time to find improvements and stuff and from the wearable marker garment stuff. like, from the looks of it, *its OK*, but I still have some question marks about.....so the thing is we found a fabrication technique, so that's *a success*, we might have to change the stitching and stuff and thats like a little more minor bits of it, it's not the major bits, *we know that* the stretchable, like the markers she has stuck on to the garments etc works with camera but now the next stage is *on us*, but like █, I don't know if you've met him, he's another researcher with us, he's a postdoc, he's the one, what is he doing, he's giving like a RGB dual camera and he's taking data *from that* to detect the markers and so the next stage is to kind of quantify the success of marker garment project is basically..... What percentage of markers can be detected from the garment? *where are the wrinkles obstructing the markers? where is the body hiding some markers? where is there some certain wrinkles coming up when you are moving the lens? etc.* we are still to start that, we have not yet reached that stage, so apart from *the main broad* idea of getting markers on a t-shirt and like just shooting, pointing and shooting a camera at it we are able to pick up some data from it, and so the next stage is we still need feedback from █'s work to see how we can improve that garment....

CM: And do you think that work is quite unique?

█: It is quite unique, I think, definitely, it was an idea before █ and █ came on board and then we proposed the idea to █ and then she got on to work for it....

CM: Ok so then, what about then....you already said some things you might have done differently, like having an *intermediary* to help with translation of different points, is there anything else you wanted around...to say with hindsight about the collaboration

█: Yeah with hindsight I think there *should* be some amount of project management so because....I think, like *please don't take this the wrong way*, but I think.....

CM: Of course not

█: Like there was *a lot of delays* in certain ways, there have been a lot of delays on my part as well and I think in all research there's bound to be a certain amount of delays, and but I think with someone who is working as a postdoc or something with whom you become directly accountable because the professors don't have time to make you.... accountable and so you have to be self-accountable and so I think having a project management intermediary in the form of a postdoc who usually takes that role, I think would have been good *both for me* and for █ and █ I think. Because we had our targets, you know the initial contract was 3 months, then it was extended to 6 months and additionally another 3 months so like we.... you know we had kept certain targets and then we *missed* quite a few of the targets and then we again reset certain targets, so I think someone who is a staff and not a student who would if they would directly, right now what's happening if they are reporting to █, or █ *but then* they are working with me and I would say even I don't have.... I can get very lazy as well or whatever... I can miss targets I think that happens quite or else.... a bit but I would say they more than lazy *is trying to get something too perfect* and I can see that in my current project, I'm

trying to get something the last 99% but maybe even 80% was fine so you are trying to perfect stuff but then you end up compromising on the whole.....

CM: So I guess that maybe to do with *targets* or something or *the goals*?

█: Honestly, *I've never worked in England*, I don't know how things work in the UK, so how, are you supposed to, what happens like, how do you respond when targets are missed?and stuff like that so its like very challenging for me and uh and like, those kind of challenges

CM: Yeah I mean that's like another thing in interdisciplinary research where it's not just between different disciplines but also between different cultures um.....

█: Exactly, I.....I.....I.... think I was a bit this about the whole cultural aspect, I think like *for example*, in █ or █ I think you are super straightforward like you *are allowed* to get upset when you miss a target or *you can*..... or stuff like that, but it's very different when you go to a *different* part of the world and so there are definitely cultural aspects to it and um, so that's why I personally feel that like a postdoc or someone like █ who has both interdisciplinary experience within engineering and textiles could be like more, I think it's *crucial* to have someone like that tend to the project management side of the whole thing, or *someone like* █ or something like that you know *to hold everyone accountable*

CM: Ok yeah, really insightful. So I think you've already answered this a little bit already as well, but were there any surprising or unexpected outcomes come about as a result of collaborating with textile design?

█: *Um*, I think I have learnt a lot about um, the stitching and the different, you know *weaving and knitting* and all those terminologies and the equipment and the methods and the benefits and the *disadvantages of that*, like personal learnings for me in the collaboration. Like grommets and stuff like that, I was investigating a lot, some rivets and stuff like that but never found what is eyelets and grommets and stuff like that.....and that was very cool to find that, I think there was some *very good* learnings for me personally, yeah these are not stuff you would find in engineering papers, even related to wearable robotics, because the, you know the whole textile aspects of that are not explicitly mentioned in those papers, so yeah

CM: Yeah, I mean that's something I've noticed.... why do you think that is?

█: I think because the primary audience is engineering and so..... they tend to *you know* gloss over these textile aspects which are *very important to the construction*. Secondary, I think a lot of them are maybe trying to patent certain stuff and so don't want to go into the *very* detail intricacies of it and that is also one of the reasons why they are only focusing on certain aspects of it and tend to not mention certain *very crucial things* that are you know very important to having a successful prototype.

CM: OK, so can I try to share this screen with you..... I hope you can see it..... So this is er, what I have here, what I want to ask you is *what type of way* you feel you were working during this project, *I don't know* if you know some of these concepts or you differentiate different types of working *already* but for example, interdisciplinary, when you are working within a specific discipline and then.... multidisciplinary where people from different disciplines are working *together, but they each drawing on their own disciplinary knowledge*, so you are still working together but working within your own discipline and then cross-disciplinary where you're kind of.....*working together*, but it is not quite as integrated as interdisciplinary, *where*..... you know you are all integrating knowledge from different disciplines you are really using *all types* of methods and

approaches, you can see where all those lines are overlapping and then transdisciplinary is about.... you know, all these different disciplines working together but it actually becomes not even what you, your own discipline because now it is like a new discipline, um, *like transcending beyond the original discipline*. So I wanted to ask you if you were to look at this, what do you think *feels* more like the type of research, or the type of way you have been working in these past six months?

■: I think this is like a very philosophical question for the whole project and er....[hearing the smile in his voice] honestly.....I'm not great at this kind of question.

CM: Well, I mean maybe it also *changed* at different *times* in the project, so.....

■: Yes, yes I think that's right, I would say, you know, like, when you are, if I was to speak from experience, I think when both ■ and ■ came on board, they, er, when I was introducing them to the project it would have been everything from my perspective, like the entire exoskeletons-suit project started from my perspective and *then* they had to go and take that and like, bring out their disciplines from within that project and er, you know then we had to find like an amalgamation of their disciplines with my disciplines, so I think that we are kind of like playing around with *all of these* at some point or another, you know. And then, the hope is for it to become a new discipline of its own *you know*.

CM: So I guess like even some of the challenges that you have been experiencing, like learning how to work with other people and all these other things, even before you begin the work, do you have thoughts about that or.....

RV: I think, um....about that...

CM: I mean, for example, intradisciplinary, I mean, it's probably not that

■: We are *definitely* not doing intradisciplinary because we are not working within one discipline, that's for sure, you know. I think between somewhere, from multi to trans, it's *everywhere* between that, you know, at the end of the day you are *all* coming down to making it *one product*, like, so, I'm going to bring in the motors and the actuators and the design of the whole, where the tendons go, where the rigid parts go, etc. ■ is going to be setting up the embodiment and putting in these pieces together, *finding the materials etc.* ■ is going to be bringing in that whole, *the pneumatic or the*, or whatever the, you know the force suppression or accompaniments to it and it's all like an amalgamation of like..... the multiple disciplines coming together *in a way ...*

CM: But in the actual making of the work.... or, at that point, do you feel like you are really crossing disciplines or you are working

■: I don't think that *we went* into each others disciplines, like ■ did not come and start doing *computer vision or design*, I did not start doing the *pattern cutting or stuff like that*, er, you know, stuff like that, ■ did not start doing the *coding or something like that* so we did not intrude into each others disciplines, so.....

CM: So in some ways, maybe multidisciplinary? Because you continued to work in your own disciplines but then you are coming together over a shared problem?

■: I think we did multidisciplinary and we did cross *as well* because if you think about it we all tried to see the whole project from each others perspectives, to a certain extent and that was what we were trying to put across like I was *always* going to try and emphasise on the functional aspect of it, they were always going to try and pressure me into the... into getting like a very finessed product and *stuff like that*, that was their perspective on it and so I think that is what

cross-disciplinary is kind of talking about and....and then inter... *is always happening* to a certain extent you are kind of integrating the methods, so my strain field methods is informing [REDACTED]'s designs, like where to put what, *where are you going to put the grommets? where are you going to put the silicon pieces? and stuff like that*, that's always going to inform her designs.

CM: So it's almost like something happens and then it might inform something that's you know, sparked something in the other, that's you know, so it's bouncing back and forth

[REDACTED]: I agree, it's gonna be *somewhere* between multiple and trans to a certain extent you know and so the whole strain field coding that I was doing, the *goal of it* was to kind of create this one, this go to software where you put, so what the goal would have been is like, you would wear [REDACTED]'s vest, *you would capture the motion capture data*, the data would go into *my* software, that software would then inform [REDACTED] about *where the lines of the tendons would go, where the rigid parts would go, where the pressurised components would be going, etc etc*. So it was this, it was *supposed* to be this whole loop of design, *everyone* is informing each other.....

CM: That's really helpful, ok. So I guess the last thing I just wanted to ask you about is em, just what do you think are the wider implications for these type collaborations and people coming together to do this type of research, if you think there are any broader implications?

[REDACTED]: *I think there are*, I personally have learnt *quite a bit*, because, like from my perspective, we could have definitely *done a lot better*, er.....I'm not, I think [REDACTED] and [REDACTED] would have been the same, I think they would have expected a lot more from me as well, er, er, and I think a *huge point* which was lacking and which would have benefited us way more would have been a project management, or someone *who understood all the disciplines and main big focus of the project* and who had proper authority over.... all of us and to kind of deal with it in that way and er.....and, er, I think that would have gotten *even more meat* out of all of our works. But I think that *definitely*, there is a lot of stuff that they know and do that I can't, and definitely there is a lot of stuff that I may be able to do that they can't and so I think that like, these interdisciplinary projects are *very crucial* to like, er, even the most successful wearable robots are indeed a team of engineers and textile designers, and er, people like that you know....

CM: The successful ones that you have seen?

[REDACTED]: So there are start ups I've shown them er like, I've passed on these patents and these websites to [REDACTED] and [REDACTED] and you know to kind of like *glean* knowledge and stuff like that....I don't know so basically *if they are doing it* I think that's the right way to do it, like I, like yeah, even I feel like, like *if I was to learn* how to do pattern cutting today and where you know gussets are supposed to go and where darts are supposed to be and stuff like that, *it's not going to happen*, you know. You guys have learned that stuff over *years and years*, and through practice and stuff like that you know.....

CM: I guess, I'm also interested just in the idea that a lot of the differences being in the physical tangible skills, but I guess I'm wondering do you feel there were differences in the way of thinking and the approaching? I mean you mentioned differences between functional and aesthetic differences. But do you feel there were any notable differences in how the project was approached?

[REDACTED]: Well I, I, I'm pretty sure, I, I, *definitely*, I can't recall some *right now*, but there were certain things that you know [REDACTED] and [REDACTED] had mentioned, which was maybe something very natural for them or something that they *had observed*, from what Nike had done, or Adidas had

done or *stuff like that*, which I hadn't noticed and when they brought it to my notice, and I like, *oh yeah, this is something that we could definitely implement* but this is nothing about the like, tangible skills, it is just about observing, er like, *other technologies or stuff, equipment or products or something about you* and you know getting a different perspective of what they were doing and so when then they mentioned it to me then you get the idea *oh yeah thats right you know we could do stuff like this*

CM: So they were like...kind of being aware of these other things and then pulling them in?

█: *yah yeah definitely, yeah, like the whole power mesh thing that █ kind of came upon that was based on like the whole sports bra thing and like it's a fabric used in sports bra etc. I'm still not confident power mesh is the material to go forward with if I am completely honest, but I think it's an interesting choice and stuff like that and so I think it's, each of us are picking different perspectives or deriving different ideas from things that we see around and that's where I think █ and █ both brought a different perspective to design with them.... and er, yeah, and I think they both very clever and so like....yeah....*

CM: Ah that really, it's really insightful █

█: *Oh no problem, I hope I wasn't being too negative or something like that.*

CM: No, I think, if you think about it really, a lot of these challenges are like.....it's part of different perspectives coming together, so I think it's only where we can consider the challenges to think about what worked this is the only way we can better understand these types of collaborations and whether or not its to better a product or to know more about another discipline or your own discipline, like my personal perspective for my PhD or focus for my PhD is about trying to understand better textile design processes and practices through understanding how they work with others and you know, so I'm really interested in understanding where the boundaries of the knowledge are and what point you kind of can kind of learn things or it comes out of your sphere of understanding and kind of like if you are really working with people or you are just kind of working on the same thing like there's a lot of, um, I think it's a really interesting challenge actually to work with people who think very differently to how you have been trained.

█: *Yeah, I think one thing, now that you mention this boundary of knowledge again as a matter of perspective, er so basically, when you guys talk about fabrics and you talk about stretchable fabrics ok, whereas when I talk about stretch it is more in a quantifiable manner and it is more about strains....*

CM: like elongation?

█: *Yeah, strains and stuff like that, I would like measure like whats the original length and then whats the stretch length? is it like 80% of the original length? is there a? so the skin stretches up to a maximum of 100% of its own length, it can go double of its own size, but is the fabrics more stretchable or less stretchable than the skin? So I look at it more quantitatively whereas you guys may look at it more qualitatively. Ok, this is super stretchy or stuff like that, so yeah I think it is just a matter of perspective etc and er yeah, it was cool in a way to work and hopefully we can get something great out of it....*

CM: Yeah, well I mean I'm sure the whole thing is very valuable for general kind of understanding, I mean whether or not it is exactly what you need for the project, you

know that's probably something slightly different.... but I'm sure that *beyond that* there's a huge amount of learning.....

█: Yes, I know I agree and even if *I was ever to do a startup* or have another, or if I was to do another postdoc or a project like that I would er, there is a lot of stuff I have learnt that I would now in hindsight *I would put into force* during the next part of my project you know, so in that way, *it's a very good learning experience*.

CM: Ok so do you think, obviously if you have never done, if you said you hadn't done something like that before, in like your education, there wasn't opportunities to have, I mean would you have preferred things in your like, your, I don't know, *in your learning during education where there may have been opportunities...or?*

█: Yes? But I think there's a lot of this real world stuff that you *cannot* learn through books you know, *like managing other people, like it's not something you learn in books* and it's something *that only comes through experience*. And even if there's something I learned in █, it might be more █-centric. It might not work in another part of the world, you know and I don't think there is any global handbook for you know *working collaboratively*, you know so...

CM: Yes, true, I guess the whole thing about being...like you obviously have so much experience working in other places as well, you know that is such a cultural insight that.....

█: Yeah, I don't know if I've put it to good use or not.....

CM: No, I'm sure you will, I'm sure you will. Like I even find between the UK and the US *is so different* and you know, *you think they would be similar*, because they both speak the same language but there are huge differences. OK █ I don't want to take any more of your time, I just want to say thank you so much, it's been *really, really* helpful yeah and please let me know like how your project keeps going, I would love to see how it goes

█: Can I send you the document in a couple of hours, I completely forgot about it

CM: Don't worry yeah, that would be amazing for my ethics.

█: Have a great day.

CM: Bye █ I hope everything goes well for you.

Interview 4.

CM: Is everything else going well?

█: Yeah, everything else is going well, getting back into work and *stuff*....

CM: Sometimes it's good to just have a few days off if you have been really busy with stuff....

█: Yeah

CM: Your body's way of telling you to slow down....

█: Yes, I couldn't focus on work with my head hurting so much.....

CM: No, *no* you need a break. Ok so, for this interview, what I will do is..... I think you read the.... paper that I sent you....but the names will be anonymised and I may then use elements of what *people say* within the thesis. Largely I am looking at developing knowledge within interdisciplinary groups.... so these will support things that I have also found within the literature or whatever else. *Thank you* for agreeing. Ok so what I will start with is if you can start with telling me a little bit about your

background.....so....professionally and academically and how this led to what you are doing now on the Fairspace project?

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

do pay attention to the function but the aesthetic holds a lot of value so I think *even* the technical factor has started to play a much more important part *now*, in developing materials and um, yeah.... I was giving, I was talking to [REDACTED] the other day and I gave her this example, it's sort of like, er..... it's like an artist trying to bake a cake where..... you are trying to do something that is not *actually* in your realm, so you are addressing different issues, where you are probably looking at aesthetics and stuff like that, and say [REDACTED], if he was a chef, he would be looking at the kind of textures coming out of it or..... the time that you are putting different elements into it, so its different aspects that you are looking at, and then, so it's the same product is being stretched in different boundaries.....But I kind of think thats the.... overall thing I would say about.....a....design person to work with an engineer, it's that *real stretch* in different areas for the same product. You're *asking* different questions, you are addressing different questions and you are sort of challenging each other because I would be challenging him in terms of other design aspects of it, whereas he would be challenging me in terms of the functionality of it, if that makes sense?

CM: Yeah, yeah it definitely does..... I mean can you think about a specific example when you talk about that kind of thing?

[REDACTED]: Um.....er.... I think like..... the data that he has *collected*. Like once he has collected data and we start to incorporate it into our work, I think that's something that makes a *huge* difference as opposed to.....I think maybe sometimes the work would take a poetic or abstract sort of take, when I was working on itbut now its like getting more technical data from the body, because sometimes I would like.....for example, if I was studying the body and developing something for it.... I would be looking more at movement *just by the eye* and how I thought the fluidity of the movement was, *whereas now*, there are actual markers on it and there are cameras on it, picking up data and showing the *actual stretch and strain* so I think that kind ofI think both are important but..... I think I am paying attention to something else *now*, whereas earlier I was paying attention to something else to like.....the more abstract sense, whereas now I am paying attention to something more technical.....but

CM: OK.....yeah....sorry what were you going to say?

[REDACTED]: So I feel like now we don't look at, so *there is no poetic or abstract* element to it, right now at least, because it's like a technical product that you are developing.

CM: Do you feel like there is a space in it for that or....?

[REDACTED]: *Yeah* I feel like that could be a phase after this is developed, like this is like the core of it and then that will come after.....like I feel like that is important, but that *may be* the second stage, in my personal opinion.....

CM: Yeah and then what do you think the involvement in this project has brought to the engineers that you work with..... or what do you think that this collaboration might be bringing them?

[REDACTED]: So I think, like.... from the conversations I have had with [REDACTED] about it.... I think he has said that it is very *out of the box thinking*, sometimes it is blue sky thinking and conceptual and then it's like *trying to make that happen*. So its like in a sense sometimes having a *lofty* idea that you are working towards it in different ways and trying to see how to make that happen so maybe its something thats not possible, *it's more conceptual*, um, but it's something that could be incorporated in a.....like a more practical way, um...

CM: Yeah....so like it's maybe a different approach or something?

■: Um, yeah like.....I'm trying to think of an example to give you.....[laughter] I think there is a lot of bounce off of ideas, like..... let's say the weaves also..... I was looking at putting clothes on the body right, so he was saying it was sort of like..... I was looking at cellular trying to make them smaller and adjusting it to the way it is expanding and stretching..so I think after that meeting he started to connect the dots with different technologies that they have and work on so er, yeah it's sort of like putting this *slightly conceptual idea* into actual practical technologies that are available from an engineer, that an engineer works with and then putting those two things together to make something up.....

CM: Yeah....that's super interesting, so you presented to him and then he considered what you presented and thought about it? Ok so what do you think that you....that.... the collaboration has brought to the Fairspace project.....or to the work that you are doing on the Fairspace project?

■: Um.....I think to the Fairspace project, it's um.....again, um, I think...I mean I think it's hard for me to say....I think like.... just interacting with everyone on ■■■■■'s team.....or in the Fairspace meetings, um.....I think just..... like, in terms of like.... what engineers are making right or considering how textiles could be incorporated into their work or things they may have *wondered* how to develop in terms of like the textile aspect that's something now that are like ok that's the things that could *be* done or ways that could be incorporated into it, so exposure maybe into different ways of how we work as well in *textiles* and then it's about connecting dots I guess.....

CM: Ok so the next thing I wanted to talk to you was about how the research focus emerged and developed so.....if you think about your brief or the objectives of the brief were developed....

■: Do you mean the objectives of the brief at the start of the project? Like with ■■■■■?

CM: Yeah, or how those original objectives may have changed, or...you know did they remain consistent throughout?

■:I think..... initially there were conversations, about things we were interested in, and that *we sort of saw*, ■■■■■ and me, like what our skills and interests were like based on what ■■■■■ had, and how we could bring that together as a team, like who would work on different aspects of it.....um..... and I *think* the objectives *have been the same* but obviously things have sort oftaken turns in terms of I think..... timing mostly, in terms of how we are developing or making work, because a lot of the things we are making... there's a lot of *new experimentation* maybe, so it's sort of maybe when you are going to arrive at a solution, maybe that's, so that's sort of.....defining the timelines, but the objectives I would say are the same, like we are still working on the same problems.....and.... I would say, in terms of time it's been *unpredictable*...

CM: Ok yeah

■ Some things worked *on time* and maybe even faster but yeah, I think some of them have maybe taken a bit longer.....than expected

CM: Why do you think.....what, why do you think that is?

■: Um... I think it's basically the thing of like, when you are working on something new you don't know whether it's going to work or not, it's basically sort of, like you *know to an extent* what you can do, but there's also that element that you *can't really*, so, yeah,

CM: What about expectations? Do you think the expected times that things take in each discipline is well understood?

■: Mmm....[laughter] Yeah, I think that's maybe a bit of a challenge.....I think maybe the timing is not that well understood, I would say maybe, like a maths problem, maybe 2 + 2 like you know it's gonna be 4, but with design, also I think maybe in design things can *continuously evolve*, like in design you can make something and it can continuously evolve and you can improve it. So I think in terms of expectations and times, that could use more *fluidity maybe*

CM: Ok, like the, you mean the process that you are working in or towards, if there was more fluidity in that it would be beneficial?

■: Yeahhh... I think it allows more room for creativity and it's not just developing a product, like, yeah, I feel like a bit of extra room sort of helps in terms of putting two things together and making it, *a bit of extra time helps*. Space to play maybe, sort of helps in developing the product *that much more....*

CM: And is that something that is important to you, that space to play?

■: Yeah.....Yeah. I have.....I have had times where I think maybe like twice in the project, where I felt like I was being pretty caught up in taking a perspective of like adding things up and..... *this is how it's going to be*, so I sort of dipped into old work and I looked at howdesign processes can be a bit more *playful*, and I kind of tapped back into that and then get back into the work and I found that to help a lot.....

CM: Yeah, OK.....And then what about, the, how would you say design processes were being made during this process? You mentioned tapping back into old work or? How did you make the decisions?

■: II..think decisions were.... I think for me its been pretty *intuitive*, its like tapping into old design knowledge.....there has also been a lot of reading....so reading, thats been *pretty new, reading a lot of literature*, I think that's been pretty new to me, because I hadn't really referred to papers in that sense, I've done a lot of like design research, but I haven't look at papers and...so.....

CM: How did you find it?

■: *Really interesting*. It's like really interesting, I think um, especially its like.... in trying to develop new work, I think it's like, again, I would say, a lot of the design research I used to do, like say, at the RCA, *the books I would look at and refer to*, they were a lot like reference books in terms of, I was thinking about... looking at new ideas *in a more abstract way*, whereas now, when you are reading papers everything starts to get more *practical and technical*. And you see the applications, so I think the application has become a really strong factor now. Its like how is this thing that you are making being applied and *used*? And its practically actually used or its in the industry or on its way to the industry *or something.....so that's something.....*and also just talking to ■ and ■ and bouncing ideas off, I think that's also, a lot of decisions were made in that way, like the three of us, just putting our heads together to solve a problem....

CM: Do you think, so what other, you mentioned reading papers....but...what other.... and tapping into old design knowledge.... but what other methods would you say you have used throughout this project? This could be processes, working methods.....

■: In terms of new processes?

CM: it doesn't have to be new, it could be just what you have been doing....

■: Ok, um so I did a lot more reading up on Jacquard and yarns ander.....working with sports materials andthe elasticity and stretch and working with the body, because this is something that we needed to see the *skin* and the stretch and strain. Even like paying attention

to details like *stitch* and how a product was constructed, so I think also it was the first time I stitched a....a....shirt myself, which I think that was also.....it gave me a lot more understanding of how it was on the body and how the materials were working *on the body*, um, because as a textile designer, I didn't do a lot of stitching of *actual garments* and.....er.....yeah.... so it was the first time I did that. And um, yeah so, a lot of research on weaving and Jacquard and the types of yarn and what it can and can't *do*, the types of weave structures and the types of yarn to use, like twill *because we needed stretch* and then wool as a natural yarn and then also like elastic yarns because that would disturb the patterns so like.... and again like I think like in the sort of work here for the computer the image needed to be *perfect* and there couldn't be anything going *this way or that* because then the computers just not going to pick it up and I think trying to work within those technical restrictions was *pretty challenging* and kind of, figuring those things out was defining the design decisions and, er.....*and now*, like I will also say that the pandemic phase has been *really interesting* because I was working with the inflatables, right, and I think through the pandemic it was either *keep it on hold* or like try and outsource it which was hard, because then design development would also be hard, or try and work on it from home so I think that became *really interesting* because I was gonna to put it on the RF welder and work from the.....materials and then try and develop something around *that*, whereas now..... I'm sort of looking at other things, like how is a tennis ball made *for example*, it has like an air bladder on the inside and then wool and the membrane on the outside and I'm still tapping into things of like bio and nature and how things are developed.... so like I was looking at the egg shell and the fibres around that material.....In the egg, they have, like a birds egg, *it's just a rough example*, they have a membrane on the outside, and then there's...well there are several layers but like the sort of fibres hold it together so I think..... there are different aspects and then like paying attention *to* very technical factors of like resistance or how it is going to be absorbing force.....um.....also looking at *other*, I think.....um....the physical aspect of it or the technical aspects of it *have become super important*, so even if it works on um... it's the *type of force* that he requires which is very specific, its like only if its, and how the material itself is going to *dislocate* and go to the other part of the hand based on when it bends. So I think those are a lot of technical restrictions to work on which *were interesting* and I kind of develop it at home with different types of *foams* and trying to recreate an air bladder that is going to expand and now I'm working on like 3D printing, so I am learning 3D software as well..... to try and develop, so I'm going to try to cast the air bladder on the *inside* with silicone and then work on a foam membrane on the outside, so... and then adapt the piece....

CM: And how do you work with 3D printing, where....do you do that at home?

■: Yeah because.....so the 3D printing will be done.....is done now, so I'm going to pick up the moulds from Imperial. Um...yeah like the, I was initially trying to work with ready materials, like the air balloon, *and stuff like that*, so I was sort of restricted to shapes that the air balloons were coming in, but *now* I'm creating an air bladder from this 3d printed mould so the inner... and then I'm going to cast the silicon and inflate it...so I can create the custom shape that will be required for the wrist or the *shoulder or the elbow* so that's going to form the inner air bladder and then the rest of it with the foam, will be the outer surface

CM: Do you find these technical restrictions, such as the *type of force* required, do you feel that these are concepts that you can really get your head around or do you kind of

understand them *in a different way* to how perhaps [REDACTED] measures them? Can you talk to me a little bit about how you understand these newer requirements, *like force*?

[REDACTED]: So I think there are probably two different ways, one is through talking to [REDACTED] when he is explaining the things that he requires and the other thing is by reading about it and reading up on what kind of force is required, so I would say a lot of *self-learning* also

CM: Do you find that aspect challenging at all?

[REDACTED]: I actually *really* like that, I don't know, *I just love reading and learning new things*. Even now, I'm reading a book on anthropology and stuff and medical ethics and things like that so it is *stirring a lot up interest* in a lot of new things, *to just learn for myself*.....

CM: Yes....that's amazing...ok so, the, has the, obviously this project has influenced and changed your established working methods and approaches, which do you think you would take forward into future work from these methods and this project?

[REDACTED]: I think the, so one for sure will be the sort of knowledge I have learned through this, I have learnt a lot in terms of technical processes, *what can and can't be done*, how work from an engineer can be used by a designer and vice versa. *Yeah*.....

CM: Ok and if you were actually to look at the physical, tangible outputs for the physical materials that you have been working on, do you think when you look at them..... it is evident to you that they have been made through a mixture of disciplines..... is it evident or visible in their physicality?

[REDACTED]: *Um*, I would like to say yeah, [laughter] I think so. I think so...*yeah* I mean it is hard for me to say about something we have both done, *but would I think so*, I think we both looked at different aspects of it, and once we start talking about it I think it's probably something that's more understandable, about how these two things have been brought together, I would say yeah, it's definitely visible.....

CM: OK.... In what kinds of ways

[REDACTED]: *Um*, I think a fair amount of knowledge comes through in that product, *um*..... like, *for example*, if I were talking about the shirt that would give shrink/ strain and stuff like that so like I mean there's, *obviously there's one person working on the coding*, [REDACTED] is working on the coding and [REDACTED] is working on analysing all of the data from these patterns and so there is like a *whole* cycle or system to this one particular product and then I am working on the textile aspect of it, so I think.... it comes across but its a product that, *maybe even the application* is stronger in terms of like the product and the application?

CM: So maybe it comes across it the application? Because I guess I am wondering if you were going to look at it....

[REDACTED]:I mean maybe not application because it's still collecting the data from it and so the data could be the application, or it's within that thing, the application within that product....*right?*.....*yeah*....

CM: So the next thing I want to ask you a little bit about is the physical site for collaboration. So, I'm wondering if you can describe to me a little bit about the type of space you work in and if it's similar or dissimilar to the spaces you have worked in before?

[REDACTED]: *Um*, ok so I think working at Imperial the physical space was er.....it was *different* from a design space where we have that freedom *to play* whereas this might have felt a bit more restrictive, *um and um*...*yeah* I think that was probably *the thing*, maybe, there was like

restrictions on what, *I think if you go to the designer space you can immediately tell, like, the vibe is different in terms of the way things are thrown are all over the place, kind of, with like all of these different samples and developments all over the place.* But here was...*it felt...a bit more constrained,* I don't know if that's a personal thing for me, I don't know if I'm used to having the place a mess but you sort of wanted to keep it...in line with the things around maybe.....but er...yeah...And I think during the pandemic *its been really interesting working from home,* that...that..... sort of working space...is.....you sort of have that freedom...to work on your own.... *but I think for me,* living alone and working from the same room, like staying in the same room is *challenging too.* Working and staying in the same space, so.....I think that's been hard.....

CM: Ok, do you think that the physical space.....has influenced the sort of work you are producing?

■:er.....*I don't think so?* I think so....I would say.... maybe in terms of interacting with people who..... I think once you are interacting with people from the same design background or when you are chatting to people from a non-design background there is always a difference, *so I think maybe that would be the only thing* I would say, but other than that I don't think the place really defines the work too much....

CM: OK so now the next thing I want to do is a visual exercise, where if you don't mind would you be able to sketch your sites of research, you can think of these metaphorically as a map or as a landscape...

■: So.....this would be the place I work at Imperial?

CM: It doesn't have to be at Imperial. It could be at the RCA, it could be at home, wherever you are doing your work.....the physical sites of your research.....

■: Ok.....

[drawing]

This is not what I want it to be *it is what it is right?* [laughter]

CM: Oh yeah, yeah yeah....but if you want you can draw what is ideal, that sounds interesting....

■: Ok I've done like the place that it was at Imperial. I think it is probably where I spent most time.....so.....at the moment what's *on my mind* is the space where I'm at, but this is probably where I spent the most time working...

CM: [looking at the drawing] at your desk?

■: Yes, I would say at my desk at Imperial....

CM: Ok and then if you needed to do things you went to RCA? If you wanted to physically make.....

■: Yeah..... physical making would be at RCA, different places. So the fashion studios for sometime and the *Jacquard loom* to make and *then the print table, like sublimation printing and..... mixed media.....*

CM: Ah mixed media

■: Yes a little bit towards the end....

CM: So did you feel as though that was an important part of the sites of research? Or how would you differentiate the work that you did at Imperial and the work at the RCA?

■: Er, I think, *so basically*, maybe I drew the imperial desk because I did *a lot of learning and research I think*, I think a fair amount of things *are new*, it's like I'm applying my textile knowledge but I'm applying it in a new space..... so. And I wanted to *know* what I was doing if that makes sense, so I wanted to learn or read up a lot more..... I did some of it on my own time and I did some of it at *Imperial as well*. I think the first part of it required a lot of digital work, so I did do a lot of *digital work* on my laptop there....so yeah....so I think that's....

CM: Oh ok yeah, so you spent a lot of time there, maybe you send me a photograph of your drawing?

■: *Yeah, sure* it's nothing great *but...*

CM: No, it's great... so I now want to share my screen with you and show you some diagrams and talk to you a bit about them

■: I think something else worth mentioning would be that umm there were....so I think *two parts* to the project, the first one was I think a continuation of work I was doing at RCA, so that came a bit more..... *easily* to me, like because it was something I had already knew and was working and so I had spent a lot of time, like doing and am really interested and I think the second part was a bit more..... challenging because it was a whole new space and so it took some time to get familiar with it as well... like in terms of working with, *like*me *actually making* a product that is going to have a function, like making a physical air-bladder kind of thing, so..... I think that kind of thing was new trying to understand the mechanics of it

CM: And were you working with new materials as well?

■: *Yeah, completely new materials, new techniques...new....errr*

CM: applications?....

■: *Yeah*

CM: Ok, so what would you think, what was similar to what you had done before in that project?

■: In that *particular* thing of working like, with inflatables?

CM: Yeah

■: Um, I think certain things, like maybe, say like a *paper mache* sort of technique being applied on to this, er like coating it and applying a mould that type of thing, maybe..... like techniques like that *sort of help* really. It's not something that I knew that I did earlier that would help into this but then there were maybe *small aspects* from there I think and also like looking at different things like origami and how that could affect...

CM: Yeah ok..... I'm just going to share this with you. um.....so....can you see my screen?

■: *Yep*

CM: So what I have here is there are five circles that talk about different ways of working across different disciplines, and....I guess as you look at them.....you can start to see how...you know, these different dots might represent different people and they might represent different ways of working together. Are there any that you are unfamiliar with?

■: Um....so...I'm just reading at the bottom.

CM: Do they make sense to you?

■: Yeah. Ok yeah.....

[reading the texts]

Oh...yeah yeah....I think I.....

CM: Ok so like multidisciplinary, for example, people may be *all* working on their own disciplines but then they *share a goal* that they are working towards but then you get to that by *drawing* on your area then cross disciplinary..... is quite close, you can really *look over each others shoulder*, you are aware of what each other is doing but then you are still kind of working within your own discipline but can see also the perspective of another. Interdisciplinary, you are really integrating knowledge and methods from other disciplines, so you might be *using something* or *doing something* that is a process that you perhaps haven't or wouldn't use.....or you are using it is another way and *transdisciplinary* is, it's almost as if the discipline *transcends above* any of the other disciplines because it is now its own *thing*, so I guess if you were to look at those...what.... how would you feel you have been working *in the* Fairspace project?

■: Um.....I think at first I thought *interdisciplinary*, I feel like thats how..... on some aspects of it we were working quite closely, *but* ...like to develop product but I think *cross disciplinary* is *maybe more apt*, because we are sort of working independently towards the same goal, but we are looking over each other shoulders.....so I think we.... because we are all kind of like, all *very accountable* maybe for what we are doing, we have taken on one particular thing and we are working on that thing but we do *bounce ideas off* to like, so we are like...yeah

CM: But you don't think that could be multidisciplinary then? that you each go away and do you thing and then come back and put it together.....into the piece, *the cross disciplinary*, do you think there are, there's things that you are crossing and sharing?

■:I would maybe actually say like..... I would say maybe *the first part* of the project that I did was *very cross disciplinary*, like the shirt, the mo-cap shirt, was *very cross-disciplinary* and there were like three people working on the same thing at different stages of that one particular thing..... where maybe for the suit because we were working on separate.....aspects of the suit individually and.....yeah.....

CM: So which do you think has been a more successful approach, *potentially*?

■: It's hard to say right....um...um....because also it sort of feels as though we have *bounced* between things, so I don't know what the *actual*.....

CM: Yeah it might be different ones at different stages

■: Yeah

CM: Like you said, the beginning of the project and the ...

■: Um.....yeah..... I think I would have to say cross-disciplinary though, I feel like we are all looking at..... *one thing* and sort of referencing one thing from the perspective of another but at the same time working independently.....

CM: Yeah and at the same time working within your own discipline?

■: Yeah....yeah.....

CM: And you think that is probably the most effective one as well?

■: I think so *yeah*, I mean..... I personally feel that its.....its really good if one person does what *they're doing*, I mean it's good to learn techniques from each other, *but what you are an expert at you need to do* and *what someone else is an expert at they need to do*. Like then you can move forward together and each person working on their own thing if that makes sense.....

CM: Yes and then work towards the shared goal

■: *Yeah, yeah*

CM:and what do you think about where the shared goal comes from and is developed from? Like the brief say..... do you think that the brief, how do you think the brief could be developed.....does that make sense?

■: I think the *goal* of what the product *is going to do*, I mean I would like to say..... it is what drives all of us in our own ways, towards achieving that....like knowing that it's going to be used in this *particular way*, like its gonna help someone to gain, either to gain data, or the suit is going to help someone in order *to help somebody* to have that sort of ability to move their muscles with that extra energy.....yeah

CM: Yeah, so the goal..... Are there things that you might have done differently, or in another way?

■: *Er....* I haven't thought about that, [laughing].....um...*I don't think so.....* I don't *know.....*but I don't think so...

CM: Ok, what I was going to ask you as well is what do you think has been particularly successful?

■: Um, I mean I..... I would probably say the coming together of minds..... I think for me that is like, *the most* interesting thing.....it's everyone bringing their individual knowledge to the project has been probably the most successful and then that turning into something *new*

CM: Ok, yeah and then what about *challenging*, what has been the most challenging?

■ Challenging, I would say, maybe less from a multidisciplinary thing but more a sort of collaborative approach I think, but this is probably something personal to the way I work, but working with different people's timelines.....different peoples workpaces, yeah..... I think that's the most challenging. Like for example, ■ *is really fast* and you know it's like with a maths problem, *ok it's going to take 5 hours to figure this out*, so I think that *fluidity* and time is probably something for me.....

CM: Yes, I think that is a really good insight, if you are used to working in a particular way...

■: Yeah

CM: What do you think about.....what do you think are the broader implications of this type of research, why are they important, if you think they are important, what do you think?

■: Er, I think they are *really important*, I think *it's really important*. From what I've learnt from this collaboration would be that it's *so crucial* to have actual factual data that you are getting from, like for example, the body, like you are getting this data and you are building a product *from it*, I think if there were more products developed like this or more research being done in this wayerm.....that... I think that'sthat's..... really interesting and also it's *really exciting right*, like if you are working with someone from a different discipline because... I think there is a certain like energy build up in it *as well* because from all of that learning and going out of your, your own particular discipline, of what you are used to and what you are used to or what you think. Like sometimes *we think, oh this works* or we think we know something and it makes sense in our discipline, but then when we look at it from another persons perspective and you think ok these other things, we haven't considered it or given it enough importance and *then*, so I think in that respect, like not just *art, or engineering and design*, but I think a whole host of

other disciplines there are people working *together* and I think that's something that we should *do more of*.....

CM: And what do you think if you were to look *back*, are there things that...what could have helped the project more, if you had..... you know...is there....I know you said you wouldn't have changed things but...

█: I think *actually*, one thing would have been, like..... I think having more technical information, *more exposure*, like I don't know how projects are usually *framed*, but I think, in terms of...say for example, if it is a multidisciplinary project like... this if you are working with one person, with █ and working with him on his project, I think it's also like the *whole discipline that you are trying to understand*, so rather than just like... this is *crucial* also but I think what would support would also be having the exposure, things like just attending *a space talks*, like that really helped, a symposium for like and how, like *medical imaging*, that sort of...like *different aspects in that field*, that sort of, like, getting all of their knowledge and understanding *the field really*, I think that really helps, so access to that kind of information in different ways, I've even just sat in the library and read books *and a lot of times I didn't even understand things* but I was thinking this was really interesting, it could connect at some point...so.....

CM: And do you think that █ was doing the same, in textile design?

█: [laughter].....um...I think *he does* do a little of it.... he does...like....start, I meanI don't know what he's doing in his time like that but he does start like using textile terms and stuff like and he's like yeah I read about this thing, and so I think he's ...yeah.

CM: So he is maybe looking at it himself a bit as well?

█: *Yeah*

CM: Yeah that's really interesting, its kind of beyond the beyond the project. As a last thing I will ask you to draw another visual....metaphor of the research, if you were to think about the research as a whole and think about *where* your expertise sits within the research, or where you sit within the research, again you could think about this as a map or a landscape.....you could think about you interacting with █ or the materials you are working with, any way you think about the metaphor of your research and where you sit within it

█: In the Fairspace project?

CM: Yeah....within the Fairspace project

█:.....

[drawing]

.....

Don't know if this makes any sense....but can you see? Okso I think that the outer line is sort of the whole fairspace boundary and all of the circles are sort of the projects that *are running on it*. And this project here is ours and there are three different parts to it and that's █, █ and me on that project and um, I think you said what our, or my influences are right so, I think like different parts of us came also through the meetings, maybe touched upon in different peoples projects *maybe* I guess that gives you different information to them as well, to just see things that were working on, our *exposure* to things we were working on that could be the impact.....

CM: So which ones are you in the circle up there?

█: So that dark one is me, and the stripes is █ and then the other one is █

CM: Ok amazing..... *thank you*. That's all the questions I had for you, if you had any other more *general* thoughts or any other things that have been important or new to you, but also if not, then don't worry.....

█: what can I say? er.....I think.....yeah....I think we have pretty much covered quite a bit of it.....

CM: Oh thank you █, that's really helpful

█: *This is really nice though*. What is the theme that you are writing on?

CM: For my PhD?

█: No, no for this what you are collecting.....

CM: Well I *mean*, it is for my PhD but this focuses on one project that I'm looking at within my PhD, so I guess I am thinking about.....textile design as....well I'm also using my own experience of kind of going into places so I'm also using this metaphor of a *material explorer* going into *new and unfamiliar environments*, using *maybe unfamiliar materials* or using maybe, so it's really got this maybe curious, a *curiosity driven element in it*, and then I'm, I just want to record, sort of my own ways of recording, such as photography and what I was doing, *writing diaries*, so things like this, and then my idea, or my plan is to think about how this is relevant *back into* the textile designer, or the textile design discipline, so I guess I am thinking, *so if someone goes away and they explore and they travel* and then they come back what do you bring back to your own discipline? you know, how is it, I'm very interested *in the boundaries, the boundaries of your research* or your expertise, *where they end or where they begin*, so I'm interested in what you said, you know, about working with the inflatables, something that was totally new, new process, new materials, I mean that is really transferable knowledge from other things that you have done.

█: Yeah..... it sounds really interesting, I think, I think even like, now that you say that I think that in India I haven't seen *that many cross-disciplinary projects*, like I feel its very new here as well right, and I think that's something that I've also been thinking about it would be very interesting to work with people over there in this space and see how that would also develop.....

CM: Well yes, I think you will also have *another aspect* to it which will also be a cultural , it's not only cross discipline but also cross-cultural which probably adds *another layer* into it. Because I guess what happens..... for me anyway, when I work with █ or something, you know.....so much of it is about...there's different languages isn't there, what someone is saying, how you've been trained. So, it's *such a different way*, you know, if I talk with you and █, you know there are many things that we can find familiarity in and can kind of understand one another

█: Yeah.....yeah....I think the cultural experience for me was when I came here,

CM: To the UK you mean?

█: Yeah, that was more interesting, you see the way programs are taught here and the way they are taught there, that was *really really interesting* in terms of...but it happened pretty fast really, it came naturally

CM: Do you mean the way textile design was taught?

█: Yeah because it's *so different* from back home. So I think just the way, yeah, but it's something that *I've always wanted*, I think even when I was there I've always wanted to *be on my own, doing my own work*, if that makes sense and here we really got the space to do that.....that was..... You have to be self-driven, I think to be at the RCA.

CM: Why, how do you think it was in India?

█: I mean in █ it was quite different, for my.....like my bachelors in design, I think even otherwise there is a lot of..... restrictions in what you are doing....in design and what you are doing in design, at least at the place where I studied it was a bit conventional. But what happens is you get very strong at *technical aspects* and business they would like focus a lot on how it would be in a business, I think different industries had different strengths, like █ had a lot of, you could go out and do a lot of *things on your own*, but I mean for me, from there to here, they *both* have their strengths but it was interesting to get used to a different way of working, like [laughing]

CM: and now you are doing it again?

█: Yeah [laughing]

CM: that's amazing, Ok, well thank you so much, that's so helpful.

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CM: what I will plan to do, basically is probably look at....you know I'm quite interested in the *interaction*, in terms of like um, peoples *experiences*, but it's mostly about um, using the interdisciplinary and the kind of like, you know working in another domain, to understand more about *textile design practices and processes*. Yeah, so anyway I will be using it as general... and might use *elements* of what you say but it also might just be that I won't use your own words, yeah so we'll see, I'm not sure exactly. *But*, it will be anonymous.

█: Yeah sounds good. The only thing that I need to be aware of is the *IP* with █ and everything.....

CM: Of course

█: I feel sure that I won't say anything that would break that....but maybe after the fact if I do...

CM: Yes, ok you can, I can, you know *scrub something out* or something like that. But I'm sure...or if I ask you something and you feel like it's a bit *close*, just say. OK, so what I want to begin with *is, um*, just you telling me a little bit about your background, so kind of academically, professionally, *um* in terms of how it led you to what it is that led you to what you are working on now in the Fairspace project.....

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[REDACTED]

CM: Mmm, mmmm, yeah, that's amazing, um what about were there *any* beliefs or values or things that *underpin*..... your own research philosophies or *interests*? I guess already maybe you suggested a little bit in terms of you know you wanted to move away from a set of goals.....but yeah have you got any beliefs or values that underpin your practice?

█: Definitely, it's probably quite hard to *articulate them*

CM: yeah, sorry it's a hard question....

[both laughing]

█: It's a good question, I should know the answer to that, [laughing] yeah I think there are definitely certain things that have kind of guided me throughout *everything* and a lot of them were formed towards the end of my time at the █. Like I think the principle of *always pushing things* and *never*..... accepting that things have to be done a certain way or thatyou need to follow *set rules*, I think that is *definitely* something that guides me because I think I always question, does this have to be that way both in my own work and in other peoples, but I think I'm more accepting of other peoples.....

CM: Mmm mmmm

█: Because when it's my own work.....there are more questions around *why it exists* and yeah whether it has to be that way or could it be a *different way*?

CM: Yeah I can definitely see that actually in your work.....Can you tell me then how you came to be involved in the Fairspace project, and a little bit about what your *role* has been within it?

█: Yeah, so yeah, towards the *end* of the Royal College of Art, I was in my *second year* and the *first year* students were about to do a *space* project that was a collaboration with Imperial, *and*.....I wasn't supposed to be involved in that at all but um, █..... emailed a few of us in second year and said *that she thought this project would be really good for us* and it would fit in with some of our existing work.....and..... yeah um, yeah so I think she saw *some kind* of link there and um, yeah if she hadn't of said, *yeah I really think you should do this*, then..... I probably wouldn't have got involved, so I'm glad that she did..... *Yeah*.....so maybe that was kind of the catalyst. Also....yeah so I took part in the project and the *first day* of it involved the people from Imperial coming to present their *work* and what they were *doing*, *which*..... was really interesting and its definitely, I think I have always been interested in *science* and yeah *Biology* to some extent as well, even those these are things that I never pursued past school level.....but...yeah and uh, it was *really interesting* to see these, I think that's also what links both of the disciplines is that, that both disciplines *are pushing for something new all the time*,

and that, um, I'm excited by anything that is doing that *I suppose*.....so it was cool to see..... what they were presenting..... in terms of *new types of sensors*, new types of *working with materials*, um, yeahso....and um...so *with* [REDACTED]'s project.....yeah so *during* the space project it was more like I was interested in *certain themes*, and some of these themes were *to with tracking the human body*, um, I was interested in *computer vision and coding*.....I was doing some work that was essentially *exploring that medium*, because I was very new to it. So I wasn't taking it as.....*you know*...a really *serious* project if that makes sense.....

CM: Yeah, definitely...

[REDACTED]: it was more an *exploration* for me. And, um, so yeah, but I think we could see that some of *our themes* overlapped with [REDACTED]'s work

CM: OK, yeah which is why you came to kind of continue past the second year, into being employed, working with the...

[REDACTED]: *Yeah* and I think what also.....I think [REDACTED].....after the project was over, we um, just went and had... [REDACTED] wanted to find out more about [REDACTED]'s work.....so we went to visit Imperial and then it was *easy to have a conversation* when it was just *you know* the three of us outside the projects *boundaries* and he was able to show us some things he was working on and we were able to say, *we have a better way of doing that*, or, *we could solve that problem for you potentially*, so I think that's why he wanted us on board because he could see that we had *knowledge and skills* that would.....that he *didn't have*.....

CM: Mmm amazing, I guess some of this has been talked about a little bit already, but what do you think that involvement in the Fairspace project has brought to the development of RCA students and researchers and alumni, like yourself ?

[REDACTED]: *Yeah, Um*..... It's interesting *because*, em, like I think that the project that we did, em, that was *at* the RCA you know *collaboratively*..... I think even though the project was, it wasn't like, it wasn't *much* of a, it wasn't like the students were collaborating on the work *itself*, like we are doing now in our professional capacity..... but I think what it did for RCA students was kind of plant a lot of *seeds*, I think even..... I'm still in touch with a couple of students who on the course and they still *talk* about that project and they still, em, you know *reference* it and I think you know, especially the context of space..... is quite *alluring* to people, so I know there are a couple of students who still really..... think back to that project and would like to develop that *work* further if you know what I mean, and I think for them, yeah helped them to see a new context for their work?

CM: What about, what do you think it has brought to your own development or your own practice?

[REDACTED]: Em..... I think probably, *similarly*.....the, I think almost..... the context....the context... is yeah, *completely* different and it definitely..... you know all of those rules that I was adhering to in fashion.....you know to do with, like *aesthetics*..... and things being *liked* and things being.... yeah a certain..... way, all of those kind of *rules*, with this project are gone.....[laughter] and that kind of frees it up basically.....because you don't have to adhere to these weird hierarchies.....there are different hierarchies, so I think for me it was very *freeing* in that sense. It sounds bizarre to talk about a science and engineering project that way, but for me it is.....

CM: Yeah, that's really interesting! And what about, what do you think that involvement in the project by say, you know RCA students has brought to Imperial researchers, students, staff, what do you think?

■: That is a *really interesting* question, because I don't think I know, *fully*.....[both laughing] but I can hazard a guess..... I think its....its..... just, I think its *always* beneficial to have an alternative perspective..... and I think, it....whether that perspective is *listened* to, or taken on board or not, is *another matter*, but really the fact that it's there.....I think..... means that, yeah...you.....maybe certain practices are questioned or.....there's a *niggle*..... of like what would they say about this, yeah.....

CM: Yeah I'm interested in about what you said earlier you know about the kind of rules that you had learnt in your.....in your..... practice learning fashion design, that they went out the window, that there was a certain amount of hierarchies, but there were *other* hierarchies that came in, could you talk to me a bit about what they were? or what you perceive them to be?

■: Yeah, so I think the, er..... I don't know..... maybe it's the way I was *taught*? Or the way that..... or something, I don't know, I think there's *two* things to do with hierarchies, there's, I think in one sense I meant more like, the um, *the approach*, the process about how you go about something like with design, its very much, like *research, initial development, design development, you make a thing*.....*The thing is the end*..... you know. So yeah.....you know it's more like a *process*, a logical process in that way, em, and, um, but also hierarchies in terms of like, I think the fashion industry has a lot of..... negative connotations and *some of them are warranted* and some of them are *not warranted*, you know there are a lot of lovely people working in the fashion industry, em.... but there's also a lot of, em, myths in terms of what is expected of you and what is achievable from fashion design students *particularly*, because upon graduating you are suddenly expected to know *how to run a business* and I think magazines and the fashion literature really perpetuates a lot of invisible hierarchies *that don't really exist*, as well.... [chuckles]

CM: So in some ways you are also talking about expectations?

■: Yeah...yeah....yeah.....

CM: So do you feel like those expectations are *evident* in what you are doing at Imperial, or you feel that you don't have those same expectations?

■: Um..... it's, they're a different set of expectations, I suppose.....they're, yeah like.....yeah, um..... I think in the fashion industry, they're a different set of values, that kind of perpetuate the..... hierarchies and the expectations like, the people in power in the fashion industry are the people who have the most.....like *clout*, I suppose..... and in the engineering.....the.....in science its the same.....there are people who have *this clout*, but for completely different reasons I suppose, *yeah*.....*yeah*.....

CM: so what do you feel like, I guess I'm just interested in what you feel that would be in the..... environment, the Fairspace environment, in the Imperial environment, using that as an example?

■: *Yeah*, because I feel like I *know* the other system very well, I know and understand it very well..... but this system is new to me, and it's very interesting to me because its like, you know, as a new person in this new world.....you are obviously trying to figure these things out, like what....what.... do, what is valued here? But I think it is.....um..... and I don't know *if I*

know really, but I think from my perspective at the moment..... it is more about *knowledge* and um, yeah.....maybe more fact based if that makes sense, the....because in this environment *you have to be able to prove things* and prove *why* something is valid.....the same in fashion you still have to prove why something is *valid*..... but the set of expectations about what is valid are...*completely different*.

CM: Yeah, definitely, that definitely resonates with me. The other thing I wanted to ask you about was, um, so how your research focus kind of emerged and developed, so yeah just kind of helping me understand a little bit about how your *brief*, or your *objectives* were developed, if you would call it a brief, have they changed, or...

█: In terms of what I expect from myself or what is expected of me?

CM:Er, both, or either, whatever you feel is about how your focus of what you are doing has emerged and developed?

█: I think the....like the....seed for it, began at the RCA, I think it all comes back to this premise of wanting to do something *new*, something that hasn't been done before....and that has led me to kind of..... em, yeah mess around or explore in places that I haven't been before, and so I think that is why I was interested in the..... like the *computer vision side of things* and *coding*, *because*..... yeah, I mean there's a difference between things that are new to everyone....and just new to me, but these things are new to me and I wanted to see.....yeah..... how that could intersect with the existing, like, skills that I already had....and so I think in terms of what I expect from myself... it is those things in terms of.....yeah trying to apply new things..... and then um....*tell me the question again?*

CM: Yeah so, just how your brief.....or the things you are working on *developed*, or how did your brief develop? The things that you are working on, *how* did you come to make specific...yeah....talk to me a bit about your brief.

█: I think the brief, it has, it kind of *evolves a lot*, like with this project we em, I think *initially* it began out of this relationship with █ and the idea that we could solve some problems for him..... so I think that has been our aim *the whole time*, yeah to solve problems for him. But I think *that's like almost* like a reductive way of looking at it because that's not the *only* thing we've done, we've actually also almost... been consulting each step of the way and we've also had to.....you know, almost had to persuade him *that a certain approach is better than another approach, or a certain material is better than another material* and..... yeah, so....but.... initially we had a document that was drawn up that made complete sense at the time and then three months in it made no sense whatsoever....[laughing]....

CM: What do you mean, like with your objectives or?

█: Yeah, we had a document that set out, a *sort of a rough* time plan and things that were meant to be done in this time....but a big part for me was that I was supposed to work with this █ *fibre* and that *never arrived* so....

CM: and this was a document that you put together, or that you and █ and █ put together, or?

█: Em, we had a meeting...█ put it *together* as a result of a meeting that we all had..... and yeah, we did have a.... it was quite simple, I think each of us had maybe 4 or 5 bullet points....and....yeah...and that yeah, that has changed as it has gone on....

CM: yeah so if you were to look at it now, it's like, it's not what you are doing?

■: No, maybe one or two things might be [laughing] but the rest wouldn't be..... but that's due to maybe like, maybe it's more due to practical, you know things outside of all of our control it's not due to our not fulfilling our.....what we set out to do, it's that what we set out to do *had to change* because yeah... but we were all working, we know we are all working towards the same goal of getting this exo-suit *functioning* and *made* in the best way possible

CM: yes so there is a kind of larger objective and then the ways of getting there are flexible, perhaps?

■: Yeah, yeah

CM: So.... the next thing I want to ask you about is a little bit about the methods you have used during your research, so this could be about ways of working, um, processes of making, yeah a little bit about the methods that you've used in your research....

■: Um, I think for me....the main way for me has been..... *making*, em, although, I feel like I'm also kind of *taking in* a lot of information, like *vast amounts of information*, em, that are mainly kind of verbal or notes, or... yeah, but I'm not necessarily....synthesising and putting *back out* anything..... in terms of, other than recording what we are doing.....and how we are making certain things, em, yeah, I think a lot of the writing and...what's the word? Yeah *cognitive work*, is maybe not being recorded as well if that makes sense? so yeah for me the main way is making and research through making and thinking through making.....

CM: Yeah, do you think that those processes and what and how you make has been, um, influenced by all of this information that you are taking in, or do you feel that you are working in ways that are very familiar to you?

■: It's interesting because.....there are elements that are *very familiar*, and um, you know some days I'll be doing something and I'll think oh this is the *same* thing I would be doing to make a wedding dress although now I'm making a robotic suit [laughter] Em, and it's funny to me that the two things feel very similar but I think that the processes that I use have *definitely* been adapted and have *definitely* changed....like um.....

CM: For example, in what kind of ways?

■: So I used to make, er do a lot of laser cutting... I used to make this laser cut lace, I mean now I'm not laser cutting the material itself, I am laser cutting a mould and *casting* the silicon into...yeah this is the bit I'm probably not supposed to say because of the IP

CM: OK, well you can just talk loosely about, yeah just talk generally, rather than specifically if you prefer? Yeah...so you are more using laser cutting to cut a mould that then er, you know the materials could then be put into rather than cutting the materials itself?

■: Yeah so *exactly*, so I think, yeah so I'm, before I had a set process that *involved* a certain machine, and then now that.... I'm using parts of that process and the *same* machine but there are....there is other machinery involved and it's a part of a *bigger*, more experimental set of processes ...

CM: Because those processes that you had done before were not sufficient for what you are doing now? so you drew on things that you had done before?

■: Yeah, yeah

CM: Well that kind of answers my next question actually, about how the Fairspace project has influenced previous methods and approaches and I guess em, another thing I wanted to ask you about is whether or not the project has influenced ... or changed any of your

previously held assumptions about um, maybe about work collaborating with sciences or engineering that you might have had going into the work?

█: ...Em, I think em, it's, yeah it's interesting like, I'm trying to think what preconceptions I did have about science and then....um, it's difficult because it's not, like....I don't suppose... I didn't think about it too much [laughing] in the context of my work. Although, I've always been interested in science and how we understand and see things..... but yeah *I don't really know...*

CM: Ok, put it this way, what has *struck* you about the ways that....yeah what has kind of struck you going into the project, you know, what are your perceptions of the field that you are now working within? You've got over a little bit I think, but if there are any other thoughts on that...

█: Yeah, I suppose if you think about, if I thought about like..... you know what people outside the fashion industry think about it, that its you know.... that it's all about aesthetics and it's not very thoughtful or.... that sometimes you see an undercurrent of, but um....that maybe people outside science might think that it's boring or that its dry and... just uninteresting to the everyday *person*...then, but... I don't think I've ever felt like that, but maybe there are elements that *are* not interesting to.... *me*, um, but I don't know I think I am just the kind of person that is interested in everything, if that makes sense, so. So even if, yeah, I think when something bores me, its when I don't understand it and it has to be *really* illegible for me to be bored by it. Whereas, like if it'syeah...just, like I don't think it's, yeah, I suppose the difference between something being not relevant to *you* or being dry or boring or uninteresting, you know.

CM: Yeah, ok um the other thing is about the physical outputs, or the research, you know the actual things you are working on, do you feel that when you look at them.... your discipline and the work of █, do you feel that when you look at them, this combined, er, I guess, different perspectives or approaches or however you want to put it is actually evident when you actually look at what you've been making?

█: Um....I think maybe not yet, because of the point of the project of where we are, like, I think we all see that, when we can get this thing *working*, it can be beautiful and it can be, it *can*.....em, yeah, functional, I don't mean beautiful in just an aesthetic sense, if that makes sense, yeah I think we all share....we all have a picture in our minds of it working *really well*, that's all that we are working towards, but we haven't got there yet.....So...the, at the moment the physical outputs, em, go someway towards what we are trying to do and they, em....yeah, it was *nice* to have it described by someone as elegant, which is not really what I, em, like thought about....it's not really anything that I was thinking about, I was thinking about functionality throughout this whole project, that's what I've been thinking about, but maybe some of your design sensibilities do just *naturally* come through into something that you make...

CM: Yeah, so when you look it at it, what do you see, when you look at what you've been working on, what do you see in these samples?

█: Em, its funny also because we use different words to describe it, like, I would call it a *toile*, it's *a test*, it's a....you know, it's not the finished thing by any means, but you know, but I suppose other people, other disciplines would call it a *prototype* wouldn't they? And so I think sometimes I use that word when I'm talking to those people but I think in my mind.....really it's a *toile*....yeah...or there is several *toiles*.

CM: So you see it as a *toile*, but do you see the engineering aspect *within* the *toile*?

■: Yeah, yeah *definitely*, it's quite, for me it's almost, it's quite, it's almost quite literal.... like in terms of the materials, like there are metal aspects and em, so interestingly, those feel, and also those particular parts were designed and made by the engineer, so those parts are *literally* the engineering parts

CM: Yeah, so they are really *visible* within the swatch....

■: Yeah, yeah maybe if I'd made them I'd still see them as textiles I don't know, even though they are metal..

CM: Yeah, yeah, ok the next thing I just want to talk a little bit about is the actual physical site for collaboration, um, so I'm wondering if you could describe a little bit about your working space to me.....and is it similar or dissimilar to the type of space you would ordinarily work *in*? and, how its different?

■: Yeah, so I think.... for me, the studio spaces, like *towards* the end of having my own business, I definitely managed to keep em, a *really nice*... I think it took some years to develop the space *to be how I wanted it to be* and I still miss that working space, *the table, the sewing machine, another table*, all exactly in the right way and all in the way where I could take what I was working on from one place to the next and the objects were *ordered* almost in like the process, you know, the way of the making process.... so yeah, I still *miss* the ability to set up my own space and control how everything is, but you know in terms of, when you work at the RCA....it's a different kettle of fish, you have *your desk* and that's *your space and*.... I think it's, and then you have the workshops where things are done, which is you know 7th floor, 5th floor you know *running around all over the place* between *different rooms* and *buildings* and em, so I think, like feeling like settled there, you feel settled when you are sat at your desk but at the same time you can't *do* everything that you need to *do* at your desk, but also I think the difference is kind of em, like, mess, if that makes sense, your desk at the RCA is like, you know you might have a few images in terms of what you are working towards and then you have the things that actually help you to *get there*, which are messy, like, theres stuff everywhere....and sometimes the stuff provokes you in terms of ideas, or you've left something a certain way because you're going to come back to it *tomorrow* and you know that it being there will make you think about that thing again or that material again, em, um I definitely feel like engineers and people *don't*....necessarily work in that same way, where they don't *build a little environment* for themselves, with all of this mess and materials, I mean, *maybe they do* but...yeah it doesn't feel the same, because the things that they've positioned around don't seem to be things that are like provoking them if that makes sense, or half finished things...

CM: What about your space then at Imperial, or the places you've done your work, because I know you've done some work at RCA and some work at Imperial

■: So, um *at the RCA*, primarily we were *using* the workshops and so then its a case of you know turning up with your big bag of stuff and *trying not to* make too much mess because you are in communal spaces, so you've got to you know be respectful and you can't just...you need to *have the items that you need in order to do the thing that you're doing right then and there*, it's not a place to think and em, you know. Yeah, you have to have planned *carefully* what you are going to do before you go to the RCA and carry something out

CM: Ok, yeah and is that different would you say? You have to be more prepared?

■: Yeah, yeah you have to be prepared, and also I think some of the processes are time sensitive, you know there's only an hour or two hours to..... do a certain thing, because of the material....it cures in a certain amount of time.

CM: OK, yeah so you had to quickly work with it. So what about, were you using your desk at Imperial in the same way you would as your work station at RCA, or how was your work station set up there?

■: So, at Imperial, we um.... yeah ■ kind of said, you can, *we'll put you in this room* and I think, um, I don't know if he necessarily *consulted* anyone about that decision...[laughter] but we were quite happy about it because we ended up in this room which is a laboratory, em, and its a room that is used for this er, this computer vision, motion capture, em so we liked the room, because it was a *doing* room, rather than an office.... if that makes sense, em, and yeah so we were fine being in there, we didn't mind other people coming in and out or experiments taking place, em we preferred that I think, *I say we*, I'm speaking for ■. I shouldn't be speaking for her at all.... but I definitely preferred because it felt *more like* a place where you could *do* things... and also a place where we could have *conversations*, and to be honest that's more what we used it for, it was used *more* for talking than anything else. Me, ■ and ■....

CM: And what about other people coming in, do you think they were surprised to see you in there?

■: Yes, yes, often yeah, [laughing] especially at first.....we definitely got a few funny looks [laughing]....

CM: Now, I'm going to ask you if you don't mind, where if you were able to, do you have a pen and paper, just really quickly sketch or map your physical research site for research.... you can think about it as a map or landscape, so you could think about yourself in one place, or moving between, like quite open

■: But its physical places...?

CM: Yeah

■ What I might do is just pour myself some more coffee....

CM: Oh you definitely should

■:[sound of coffee pouring].....I made it a while ago and I forgot to pour it out, but that's ok because I was finishing the previous drink...it's not.....[laughing].....ok, so.....*sites of research*

CM: Yeah, I mean it could be one site, it could be...whatever you think of as you think about your physical site during the Fairspace project

■: I think it's em, I mean now there's pandemic times, but maybe I'll just think of it overall.....

CM: Ok, yeah yeah sorry of course, but you could include that if you want or do before or whatever you want....

■: Ok, so....

[drawing]

...there's home....there's.....

It's not the best drawing.....

CM: Oh don't worry...

[sound of drawing]

.....how's it going?

■: Yeah, its ok....so this is what I have...[laughter]

CM: OK

■: [holding it up to the screen] Is it back to front?

CM: No I can see it, push it up a little more, I can't see it all in one, but maybe you can take a picture and send it to me? So what is that, is it your desks, or what is that, sorry?

■: Yeah so like, I suppose the outer square is like building, so like the RCA and at first I was like, *oh that's the big tower*, but then I was like, no but where do I actually do my research? and so I was like OK *the resin room* is where I spent most of my time, but also the shop was really important and *then* here's Imperial, em...

CM: And that's the ■■■■■ room?

■: Yeah, that's just the ■■■■■ room. Yeah. I've not really put much else of Imperial in and then afterwards I thought, where else do I spend the most time at Imperial, *oh maybe the cafe*..... but yeah, in terms of talking to people, *sometimes we'd go to, you know, one of the cafes*, but yeah, this is mainly the research site at Imperial.....

CM: Ok, yeah and then going back and forth?

■: Yeah and then that's my desk at Imperial, yeah, and then these are robots, these little circles...

CM: Oh ok, and what's the thing below?

■: That's my laptop

CM: Oh ok, amazing...

■: And then this is home, which is a couple of desks in different rooms

CM: Ok, yeah so you've got a few spaces in there that you..... presumably move between?

■: Yeah, yeah..... but at the moment, there's *just this one*, but these things still exist in your head when you are thinking about your research....

CM: Yeah and were you moving between them quite frequently or, how often would you?

■: Yeah towards the, like em, it's interesting because I think towards the more recent part of the project... we were *more* at Imperial, *definitely*, and less at the RCA.....

CM: mmm Ok, yeah so do you feel that these sites that you've been in have influenced the physical types of... prototypes that you've been making?

■: Yeah, definitely, em..... well I think the RCA's.... has influenced it *more physically* if that makes sense, in terms of *what and how* we are making things and Imperial influenced it *more* in terms of analysing what we've made and considering whether it's working *or not or what we need to change*....

CM: OK, now if you don't mind I'm going to share my screen with you, showing you some diagrams on interdisciplinary research, and I just want to get your thoughts on the type of research that you've been doing. Ok, so.... can you see my screen, maybe I can zoom in a little bit, ok so...

■: Can I take a photo of it?

CM: Of course, *of course*, yeah, so basically there's these different diagrams here that represent *different* ways of working with other disciplines and the first one obviously intradisciplinary, working within a single discipline, so you know working as a textile designer on textile design projects within the discipline, so multidisciplinary is working together, but each drawing on their own disciplinary knowledge, so maybe you kind of have a shared *goal*, but what you are actually doing rests within your own discipline and then cross disciplinary, so viewing one discipline from the perspective of another, so you might be *doing* your work and then maybe crossing over to do it a little bit from you know, another person's discipline, so maybe you could be using methods that *you haven't been using previously*, so you are kind of seeing things from the perspective of another, I guess and then interdisciplinary, um, you can see all... um, kind of, all overlapping but thinking about thinking about integrating knowledges and methods from different disciplines and really using a whole synthesis of methods, so you might be using some of your own methods, but you might be using some methods from other disciplines as well and these are all coming together to work on the project, or towards the goal. And then I guess transdisciplinary is really about when the project is *becoming*, it's not really any longer, either of...or any of the original disciplines, because it's now kind of its own discipline, so it's kind of transcending the disciplines on which it was based, so I feel I just want to ask you and talk to you a little bit about, you know if you were to look at these and think about, you know *you* and your collaborators and think about what ways you might have been working?

■: Hmm, yeah I *think* at different times we have done like almost all of these, but I think maybe the one that sort of resonated the most with me seemed to be *the interdisciplinary* one because um, the, um the things that we are making, *wouldn't exist* without the input of both people if that makes sense and because yeah, yeah its a physical item it's easy to see that you know *this has been contributed and this has been contributed* and they are both inside this one item and that item wouldn't exist if we hadn't successfully integrated knowledge, if we hadn't....managed to come together...to yeah with our previous experience, separate experiences to bring them into this one thing. Yeah, maybe I think, the transdisciplinary approach is kind of what we are aiming for, em, but I don't think we are there yet, *if that makes sense?* Because, maybe also that will come as we *evaluate* what we've done and *test* what we've done and then we'll be able to bring our individual experience to that evaluation, if that makes sense and then I guess then that will inform what we do next.....Which might be more of a coming together of like *frameworks* if that makes sense

CM: OK so like you might reevaluate and then kind of set a new goal

■: Maybe *we are* doing it, maybe we are, maybe we have created a unity of things but mm, but *not quite* if that makes sense, because of where we are in the project, I think.....

CM: Yeah, ok, alright, thank you

■: But I definitely kind of resonated with all of them a little bit, if that makes sense

CM: Yes, it does. So I think my last area I wanted to ask you about was kind of reflecting on the process as a whole I guess. That diagram was thinking a little bit of thinking about the experience through these lenses, and kind of the research terminology that considers how people work with others and I'm thinking now with hindsight, are there any things

that you might have done differently throughout the project, em? It could be larger things or even smaller design decisions.....

■: Em, it's an interesting question because I think sometimes when you are *so in* a project you don't kind of step outside to think about some of these questions.

CM: Yeah, definitely.

■: But yeah, I suppose, I think, em, I think *in terms of roles, in terms of defining our roles*, that would have been helpful to do at the beginning *because* I feel that we are doing *more* than what is *perceived that we are doing* if that makes sense, so I feel like *our role* is sort of quite undefined, if that makes sense

CM: Maybe that's if it's not perceived, maybe the recognition of the things that you are doing is not understood?

■: Yeah, yeah I think in some ways because ...its, because its, because its, um, because the people in the project are working in this way, that is across these disciplines, but, there's *no...* well there are a *couple* of people, but there's not a, um, like a managerial structure that is set up to support that kind of activity, I suppose, *if that makes sense?* So in terms of, so when the project is evaluated, its evaluated on *those* terms, if that makes sense, on the scientific engineering terms

CM: Yeah, like what's the criteria for success, or something?

■: Yeah, that's how it will be evaluated, we know that, so we know that we have to....you know that's..... the perspective that we are working towards

CM: Maybe, is that something that is new for you? That you are trying to meet new criteria or?

■: Yeah, but, yeah it is...em but I think also its like....em the, *if* at the beginning *maybe I had been a bit bolder* in terms of setting out *my own role* and *what* that would be and what *I* felt those expectations would be, then.....em, I could evaluate myself against those, if that makes sense [laughing]

CM: And what do you mean by bolder?

■: If... I had said at the beginning, you know, our role is *to consult*, which *is what we're doing*, but I don't think I ever framed it *that way in my mind*, but I think that's also a very personal thing, like I think, because I think the way I approach my work is obviously to do with making and is to do with producing a thing, I think it's also a um, a like, a *career* thing, rather than a discipline thing if that makes sense...

CM: Yeah, I guess I'm thinking like if you em, you know by suggesting you had been bolder but do you think that at the time you recognised that was something you needed to do but you didn't do it or do you think that it was after a certain amount of time that you recognised perhaps that was something you might have done, do you think there were things that you thought about doing but didn't know how to do them, or?

■: mmm, I think it's also, it's just... the kind of mode that you are in, when you start a new, when I start something *new* I'm very much in a kind of listening mode *if that makes sense?* You are there, you need to understand where you are, you need to understand whats going on and so I think, I don't know if I could pinpoint when it *should* have been but yeah it felt like, um from the outset if your role is clearly defined in a way that you want it to be defined if that makes sense.....then it could be better.....

CM: Ok, yeah and what about successes, what do you think have been successes throughout the project, it could be things that have happened in the material, it could be broader things um, yeah

■: Um, I think there are like, um a series of small successes when you get different things working, different parts working, em, thats always a *really* good moment, and so yeah there have been a few of those, maybe like 4 or 5 of those that I can think about, where I like got something, um...yeah, I think other successes are also like when...when... you successfully get your point of view across and its....*oooh I was going to sneeze*

CM: Bless you

■: Thank you

CM: Have you got hay fever?

■: I don't know, *maybe..??* Yeah I think, when....when because, I think sometimes when you bring up a point and it is an accepted *truth* in your discipline, initially the other person might say *no I don't think so* and then maybe it takes them a couple of weeks to come around to your way of thinking

CM: like so what do you mean, are you thinking of something in particular?

■: Yeah, so it's happened with quite a few things, like where... you.... have to, where you, you'll express something, that something should change or something should be done in a certain way, or a certain material should or shouldn't be used and then *you know*, at the time the point is maybe not quite taken on board, but *later* you can see that the person's mind is changing or that you've influenced the way that they go about *the next thing* that they're doing *if that makes sense.....? [laughter]*

CM: Yeah, yeah that does make sense

■: Yeah, so you can say, yeah, aw you know, I said that two weeks ago and now you're doing this so it feels quite good...[laughter]

CM: Yeah, because I guess it's also validation of your kind of expertise being valued or whatever else

■: Yeah, yeah um, but definitely also I think a success has also been in the last couple of weeks where we've presented our work and yeah.... we've done the two presentations one to the *Fairspace group*....and....which was met with more technical questions but in presenting our work to RCA people that definitely felt like a *success moment* because we were able to bring back some of the....you know....knowledge or things that we've been doing and show them to the people who you know hadn't been involved in the project, you know.. in its current....for the past year, but were *very involved* in you know setting up the project and in *enabling* the connections that led to what we are doing now and supported the project in terms of like....you know... time and materials and you know space at the RCA and things like that. Um, yeah

CM: Yeah ok and then.... so I was going to see if you could do me another sketch which is about a very simple map or landscape which is if you think about it as a visual metaphor of the journey of your research

■: The journey....

CM: Mmm yea, it can be very quick....So you could use yourself as, maybe where you do your research, the type of research you do, it might be about materials you use, the people you interact with, but think about it as a map or a landscape and you on a journey

■: Ok. Mmm

[Drawing]

Whispers....a landscape....

[Drawing]

No text?

CM: Whatever you think

■: I've just draw a line [laughing]...I've just drawn this... [laughing]

CM: Ok, yes that's great, what does it say on it, at the beginning?

■: That says RCA and that says Imperial

CM: And then you are near RCA?

■: Yeah, I don't know, I think I just put myself at the beginning, like its a line and it's going up and down and its moving forwards *and* the, its like....um I don't know where it's going but its going *up*

CM: Well it looks like it's going towards Imperial?

■: Well it's like, it's more like this is where I am *now*....yeah, maybe I should have put myself there...

CM: and who knows what's next?

■: Yeah..... I've moved myself over [laughing]

CM: Ok, well it's good to see that you are on there twice, because you started there and then moved along. Ok, great, could you send me a picture of that one too?

■: Yeah, I can do yeah....[chuckling]

CM: Ok, my last question ■ is just around *these type* of collaborations and what do you think, if any, are the broader implications of these sort of collaborations, you know beyond what you are doing specifically within this project, why do you think these projects are necessary, or do you think....*they are?* or what do you think comes out of the things that you are doing?

■: I think they are definitely necessary, because um, you know often when, often when....you know when I look at projects, you know for example, when you look at some of the projects at Imperial, you can, you think to yourself, you know *that would have really benefited from some design input*, [laughter] but then also sometimes you can look at projects at the RCA and think that would have really benefited from some engineering input or some technical input to get it working better.... or you know, em, and er, yeah so I think they are *definitely* necessary, because also you can see things, you know out in the world, in a similar way where you can think you know that would have benefited from somebody else having an input....

CM: So in terms of, you're really thinking about how an output, how a physical output like a product, or an item or something could be *improved* by having...

■: Yeah

CM: And do you think there is anything else, beyond, *beyond* the products? I'm thinking of the ripple effects, what could you think might be the ripple effects of these types of collaborations?

█: I think, em.... I think when, I think an outside perspective is *almost always necessarily on everything that you do* and em... yeah I think almost all organisations or....you know, almost *all systems*, could benefit from *an* outside perspective, whether it's just someone who's not from that country telling you how they would do it there or....you know, so I think *the* implications of *broadening your perspectives* and having *an open mindset* in terms of being willing to accept other perspectives and other opinions is something that is *needed* and even though sometimes it's something that people don't like, or people *don't want to do*, just because sometimes it's *uncomfortable to be challenged*, em, I think that everyone needs to get more comfortable being challenged basically....

CM: Ok but why do you think that, why is it necessary to have these other perspectives on what you are doing. I mean I know that's this is not an easy question really....[both laughing] but I'm curious what you think

█: I think having a fixed mindset with something can help you if you are um, you know on a journey to get something practical done, for example, like make, in order to physically make something you need to have a *fixed idea* of *what your going to make, how you're going to make it*. Em, but...in order to ask, you know, other questions about *why* is it, *why does it exist, why, who is for and why is it being made* you need other perspectives in that conversation because otherwise you may not have considered that, em, that thing might be completely useless to some people, or, for a particular reason, do you see what I mean....

CM: Yeah, ow ok. Um, I mean that's all of the things I wanted to talk about, it's been really helpful

█: Yay

CM: It actually went much longer than I thought, sorry, thank you

█: Don't worry it's probably me banging on about things

CM: Thank you so much! So you've had your thing extended right?

█: Yeah, so we are there until August, yeah, who knows what will happen after that....

CM: and then you hope by then you will sort of finish what you set out to do by then or....

█: I don't know, I think it *really* depends on pandemic stuff if we are honest and I think at the moment █ is not really taking that into account and it's a bit difficult because he's very set on achieving certain things and *we want* to achieve them as well but you know when he's sent you something and it's taken three weeks to arrive and then it's not right when it gets to you...and it's like...

CM: It took three weeks? Just in the post?

█: Yeah and then er.... he 3D printed something for me, and then, and *now*, because the support material is so thick I can't remove the support material and so I can't use the thing that he's sent me basically....

CM: Ah!

█: And then, when that's something that you had planned to get done, last month, *you know what I mean?*...in normal circumstances that would've taken *a week to do*, do you know what I mean? So I think, yeah, you know I want to get done as much as I can at home, but I'm worried

that it won't be *as good* as I could have done otherwise, *you know, but yeah* you've just got to work with what you've got haven't you?

CM: Exactly, you've just got to work with what you've got! Ah, thank you so much [REDACTED], I really appreciate it.

[REDACTED]: That's ok, that's ok.

CM: I'll definitely let you know how it all goes....

[REDACTED]: Yeahhh, ohhhh yeah what did you think about our RCA presentation?

CM: Oh, I thought it *was great*, I really...I mean I think everyone really seemed to enjoy it...

[REDACTED]: Yeah, I'm glad we did it...

CM: Yeah, I think they loved it. I mean to be honest, I think if you are working from home and stuff and then you have an opportunity to see the work of alumni who have been working on this project, you know it's also a big um, I don't know how to even say it but you know working with Imperial, textile design with Science, I think everyone is thinking about how these things *might work* and you guys have been a part of that and so I think people *are really interested to hear about your experiences* and not even only the successes you know, what you have found *hard* and going *between spaces* and like I think everyone recognises *hopefully* that this is a really *big part* of it as well. But yeah I mean, *my perception* was that everyone really enjoyed it.

[REDACTED]: Yeah, good

CM: I mean [REDACTED] really liked it, and me I mean I had seen some of it actually.... but it was really good to see it also in context with [REDACTED] slides

[REDACTED]: Yeah, yeah, I think [REDACTED] and I were talking about [REDACTED] question... it took us about two days to understand [REDACTED]'s question but then we did and we were like ahhh

CM: About why the arm?

[REDACTED]: Yeah, about unused muscles in the body....yeah because I think what it is that, if, I think there are some muscles in the body that we just don't use very much, um, and so it would make sense *to test on those muscles* because then you could get an almost, a kind of control, because then you could build the muscle up *from almost nothing if that makes sense?*

CM: OK

[REDACTED]: Rather than what we're doing

CM: Because you are trying to kind of strengthen the muscle?

[REDACTED]: Yeah because we're working with muscles that healthy people already use, if that makes sense...

CM: Oh I see what you mean

[REDACTED]: That are already in use, yeah, so at some point maybe we'll talk to [REDACTED] about it, we'll see....

CM: Yeah, well it's interesting you say that because even when I was proposing the first brief that I was working on which was the fibres with [REDACTED], you know, with um, that to create a textile, you know, [REDACTED] was also keen to make a sleeve and because a glove is really...and [REDACTED] was talking about if you make it on a surface that is not planar, so it's not flat, you are then going to have to, *when you test it*, there are suddenly all these other things that come into play, like how is it interacting when it is in motion? and how is it interacting when it moves back and forth, and in this way, so there's all these other

things that happen so that when *you test it* you can't just test does, it heats or does it not heat? because I guess she is aware of all these things, *because of her background she understands all of the things you have to test for and you will have to validate*

█: Yeah you can just test one thing when there are all these other things that are influencing it, unseen things that you might not necessarily think about

CM: Yeah, and I'm not sure *why*, well I mean, probably █ and █ also *must recognise that, I'm not sure?*

█: I think, I think █, I think █ does, but I think he can be *very single-minded*, he has a tunnel-vision thing going on. Which will be helpful in terms of getting him where it needs to be but I think there is some things that he really hasn't...[laughing]

CM: thought through, yeah

█: Like even now, he says, *I want to test the thing, finish the thing*, send it to me and I'll test it and I'm like OK, I'm making the thing and then you know, like last week I was like I've got something that *you can test in different ways*, but how are going to test it *because it's designed for my arm and it's designed for █'s arm and you're not going to have either of us there when you test it are you?* So he's now trying to 3d print an arm that's like mine and █'s....

CM: Oh! Like, but not?

█: Well, we've sent him *some measurements*, you know and yeah, I'm sceptical about how well that's going to work because yeah a *3d printed arm is not an arm* you know, it's not going to move....but maybe what he can test, is the *strength* of the material and whether it will or not he can pull as much as he needs to pull....

CM: Yeah, I mean maybe he just wants some results to analyse...

█: *Yeah, yeah* maybe but definitely, he's only thought about that when I've said, how are you going to.... exactly going to test???

CM: Ah, funny! Well, I'm also going to interview █ on Friday...

█: Ah, cool well that will be good.

CM: Alright, well I think I will grab lunch, well have a really goodrest of the ...Wednesday, have a great rest of the week

█: Ok, yeah definitely, I'll speak to you again soon!

CM: Yeah

█: We'll have lunch soon....

CM: Yeah that would be nice! I've also found out Stoll is opening up and stuff so I kind of need to figure out what my next steps on that might be, but I've just been a little bit focused on the interviews right now....

█: Yeah, I'll, I keep meaning to do at least a little sketch for you.....

CM: *But don't worry, whenever works, ok talk to you later....*

█: OK, speak to you later, bye

Interview no. 6

CM: Thanks so much, yeah, thanks. So first question is if you could introduce yourself and █ and then tell me a little bit about...your.... the capacity in which you were involved in the Fairspace project

█: Fairspace one, OK. I'm █, I am █ in Textiles at the RCA....er.... I was part of some of the initial discussions with █, who was at that time leading the Fairspace project and there were a couple of issues that they thought the textiles might help, one of the.... I think at that time they offered us four *different* projects if I am not wrong, the first one, is about this exoskeleton....exoskeleton project that I think █ is involved at the moment so they were wondering if textile could be a solution not just as a carrier of all of the platform but the structure itself....and at that point we proposed this hard and soft *idea* of using textiles and some how *invisibly and obstructively* integrate some of the electronic components that they use this was the....the first I think, initial idea that they thought we might be helpful and.... the second part is about creating some sort of functional surfaces like antibacterial, self-cleaning surfaces, *anything* that actually might help to clean the surface, especially from dust and all those things, but... I remember we felt, I mean it's, it's quite straightforward....oh I'm so sorry, he is *extremely* noisy, so sorry █....

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So the second part I believe is about creating some functional surfaces, some functional coatings, like *antibacterial*, some anti resistant coatings like specially to this, some kind of a....you know, dust structure, *but*...I mean, I remember that I felt it wasn't....it wasn't novel especially because it doesn't, you know like....go beyond applying another functional *onto textiles*, so that's why we weren't keen to continue with this..... and the third one, the third option... is actually creating this air....this cooling system....that... into the garment and I remember I think █, █, she was doing a postdoc at █ and she was creating this █ *project*, something like this, creating some fragrance she was using channels through the structures, so I think the initial....yeah the initial discussions started with her,

CM: Who was this sorry?

█: I'm so sorry, I would have to check her surname, ah yes, █

CM: Oh ok, I met her some time ago, I didn't know she was involved with the Fairspace project....

█ I think█ invited her and I remember we met once in the V&A cafe, *but* I mean, she has her own project and I think at that time she filed some patents, but I mean the idea was *quite*.... quite straightforward, she was using some kind of tiny pumps and then integrate it into the textiles....it was something like that.... and this was the third one, I think there was a fourth one, I'm so sorry I can't remember.....

CM: Maybe █'s ECG one?

█: Yeah, I think it was █'s design, I think he was creating some circuitry in the textiles, but in the same time he was.... I think he was involved in creating *some sensors* but they somehow coat the tip of the sensor so they might be able to detect *some enzymes* using sweat? Something like that? I remember we met, I think you also joined me? One of his colleagues actually..... I can't remember her name actually, from Imperial, she was a biochemist and then....yeah I remember we sent her some fibres, but yeah they never got back to us,
CM: Yeah we talked about fibre optics maybe in that session ?

█: Yes yes, I think the initial discussion and then at that time █ and I....we were discussing about how to frame the context project and then Fairspace project, the futures context project would be like a good option because we will have this technical expertise in the fields and they had, I mean, we proposed these four different schemes, four *different pathways* to follow and each, for each pathway we also had staff from Fairspace team and this was how it started actually, it was actually....at that time █ they were *second years* and they voluntarily contributed to the project, not as part of this unit system but like as an extra work and then they joined the team....as the designers, as this is how I remember, maybe I missed something, but....

CM: Ok, and then you were involved....in the Fairspace project after that as supervisor to me and also kind of

█: Yeah, yeah I mean, I think I was like a *facilitator*, I mean I am not, you know, like actively engaged in research, I mean I was like engaged in some parts with you and it is the same case with █.....*but* I mean I'm, at that time, I only see the, especially in █ case....I only see the final output or the....let's say the prototypes.....

CM: Yes, and especially with enabling access into the workshops.....

█: Yeah, yeah.... and managing some paperworks....just to ensure they have access to facilities and so on.....

CM: Yes, yes....ok, so my next question is what do you think that the kind of primary drivers were in order to develop this relationship?

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█: OK, yeah whichever you feel comfortable with, ok...sorry could you please just repeat it?

CM: Oh yeah, OK so I was just wondering like what do you believe that like the primary drivers were for facilitating and developing the relationship? So for example, why did the RCA want to be involved in this project, and why do you think Imperial want to be involved in this project with the RCA?

█: I mean...umm.....frankly, I don't know their *initial* motivations to engage with us, but I had the opportunity to see some of their prototypes, and it was.....it was.....from a textile point of view, I think they were quite...*raw*...and its needs...I think they can look *much better* and I think they can also work.... *function*...they can also *function better*, that's what I think. The reason why we *engaged* with Imperial at that time, I think we thought *all this territory* and the scope of

the project because it was *quite broad* and at that time when they introduced the project to us, it looked like a *ten...* you know not just a two, three year project but it was like, it sounds like design *in a much longer term* and they told like there are several phases, I mean from the intellectual curiosity let's say, we were very interested because *it's not just designing something*, it's not like proposing a functional prototype or anything, its like each project were connected to each other somehow and we were quite interested in understanding this robot human interaction part *especially*, in a very extreme condition, especially the space itself and the requirements of space, it was quite a challenge and also it was quite interesting for us to *explore*, and I think it starts with this intellectual curiosity, *and* how it evolves actually....I mean for me, I think we also *discuss* if we can just contribute or write a very small work package for the project team but what I understand from the logistics of the....this Fairspace one, I'm not sure if there will be a second phase, I mean it's all about time commitments..... to be honest, I....Ithink there were better opportunities at that time, if you say that it will be a *longer* term commitment, so I'm sure we are just gonna draft something, but we couldn't foresee it actually, we couldn't see the future, thats why..... I mean but, frankly, I think, its excellent to have some biological links with Imperial, not because they are convenient, you know like, *logistically*, but I think they have *amazing* facilities, you know I think it was a very *good* thing at this time that they understand the *design aspect* and I think this was the point that they were struggling..... and this was why actually, that I offered my help to *facilitate* and to.....somehow work on their researches and.....yeah.....your...yeah.

CM: OK and then the next question is about the early stages of the project, so what do you think.....what did you feel would be the benefits.....towards the development of the RCA students or researchers or alumni who would be involved in the project? How did you feel it.....yeah

█: I mean, always, *we always*, I mean in my case, I always check, what will be, what will be our benefit? I know it sounds very pragmatic, but it is..I mean like....so the benefits at that time that we saw it, because especially our students those in this future context project, they were even struggling to access *the wet chemistry labs*, the hood for example, the benches, the hood, or lets say a controlled chemistry environment and *very simple* characterisation tools, even like these multimeters, SEM microscopy and *all those things*, at that point, these types can be easily done at the Imperial. I think the first *initial* motivation for me was that..... just accessing some of the facilities there, but *in favour*, we also offer some of the making facilities which is.....which is.....sort of you know, *unique* for them, because I remember, that we haven't..... I think we still haven't allocated a budget. This was part of the conversation, but it also depends on the scope and scale of the project, so we didn't take any further, but as I said, the reason why we didn't take it any further, because, I mean, it is that there are *lots of uncertainties* at the Fairspace project, because like we weren't sure to be honest that, if there will be a *second phase*, so if like there will be a second phase and they were talking about like *five more years* then yes, sure, then we will take a shot...but yeah.....

CM: OK yeah, and then what do you think that the RCA's involvement, what do you think that the benefits might have been.....to the development and work of any Imperial researchers that were involved in the project?

█: I mean, I can *easily* compare the work, I mean, the final output, with the previous, or lets say the preliminary designs, so like they were all theoretical at that time, they were theoretical

because they have....haven't thought about, you know, *this human interaction part*, so they were just considering the garment as *another* medium actually as a plastic film or something but now they talking about this *drape-ability*, they were talking stretches, about crimp, bending, you know this *type of elasticity with the body*, so I think... for them.....they realise I think they realise different aspects of their design and I think *they understand that there is something else beyond the functionality*. Even the system work as a functional component, they understand that to make it wearable is *something else*, and the textiles is not just the carrier in the design, and the textiles can just support *their* system and promote the function, or if you make it wrong, it somehow diminish the function, so I think that they understand this relation..... I think that this was *quite*, I think, yeah.... honestly I think that this has opened up a new like, revenue for them, a new design revenue, so they are starting to test their *functional, or this functional system* in different settings, so we can especially, we can clearly see, in your project and also in [REDACTED] project, you know like they understand this *hard and soft* and the compatibility and the incompatibility of the material elements and they are trying to propose something *unique* and something quite *good* that can work with the body and especially, *the body in motion*, which is quite...

CM: So the next question that I want to ask is just about the *site* of the research, so for example, either the meetings based at *RCA* or *the meetings based at Imperial* and this could be at the early stages of the context project, how the researchers at Imperial came to *RCA*, or how later, *myself*, [REDACTED] *were based at Imperial*, but how important do you think being based at one or other of these institutions or people moving to present at another *is* on the *whole process* of the interdisciplinary relationships?

[REDACTED]: Yeah, I think...yeah, we haven't organised regular meeting and I think we *should of done that*, because if we had done, I think maybe we would have been more *familiar* about the work that you produced there or I don't know [REDACTED] and *maybe* we can just I don't know propose some *new ideas* or just explore, you know like..... I think there was this miscommunication, but I can totally understand that, *because* as I said, it's not like a committed project, if it had been *like a research project* we could just commit our time or if we had had *such a binding agreement between us, actually financially*, it could be something like the supervision of someone else, *maybe someone from Imperial*, so I think that will definitely, like reinforce the link between us, *that's why we don't have any regular meetings*, so all the meetings we have *basically* had you know is just to keep us updated, especially with *your* research and with [REDACTED]'s research. But when it started with the context project, so the context project, it had a brief, so each week you know, *we knew each week who was doing what*, so it was... in the context project, the conversation between RCA and Imperial, *was very smooth*, it went very good, so they *came with us to the assessment and they join us in the assessment part*, they share their ideas, they took some of the ideas forward, so this part I think *was OK*, but when the context project ends, because then there was no brief,..... and everything was quite open and then also, since we are not part of this Fairspace project, there were also some *confidentiality*.....issues, there was some information they can share and some can't, so yeah...

CM: Ok, yeah so that became...So really do you think that there should have been more meetings back and forth between RCA and Imperial?

█: Yeah.... and also we don't have like allocated task, we don't have *any milestones*, we *don't have a work package*.....We don't have any....we don't have to actually have to show any outputs.....

CM: So maybe that's to do with the scope of the project being a bit unclear or the scope of the relationship?

█: I mean, yeah.... it was more or less *our contribution* to the project that was unclear, I'm sure they have very clear briefs and specific work packages to complete.....but it wasn't the case for us, I mean there was these specific issues, like you know the *changes of PI* and all sorts of things....you know it was quite.....

CM: OK so the next question is, I'm just going to show you *this...this um.....* diagram and then I will ask you at different points how do you feel like the relationship was, so for example....with the context project, then perhaps with mine and █'s work

█: Which one fits what?

CM: Yes, exactly! I will just share it with you..... OK, so I'm just going to share it with you.....So for example, if you think about....you can think about the relationship as a whole, between RCA and Imperial and what type of relationship you think perhaps that might have been, and then also the relationship in the context project, so perhaps the students working on the technology challenges.....

█: I mean.....in the multidisciplinary.....so in the context project I think it was *more multidisciplinary part*, especially the students, you know they read the brief and they respond the brief based on *their experience and their understanding of the project to be honest* and even though they had some *feedback* from the imperial researchers.....there wasn't....I mean..... I'm not so sure how efficient we were to create a like a *very cross-disciplinary or interdisciplinary* working environment I think it was a more multidisciplinary one, I mean they.....they.....they heard their ideas and they understood you know this perception of textiles and their designs but I think it was more like..... multidisciplinary. So like, what I.....to be honest I don't know very much detail of your project, but based on the presentation that I attended to █ and █ presentation, I think they have a very moreclose relationship with █, and it for me, I don't know if I would describe as *cross disciplinary*, I don't know if it will be, but it looks like it will be *an interdisciplinary outcome*. So the first thing, is █.....I mean.....they understand how to work with the scientific mind, this is one thing....you know..... but at the same time I think █ is quite open... to this kind of interventions, so I think it also a very good thing and I think it will look like a very interdisciplinary one. For your case, Claire, just correct me if I am wrong, but like.....you are very open, you know how to work with scientists, you have already done so much like.....work with Footfalls and Heartbeats, for instance, and you understand.....your project is very interdisciplinary but it's *all about the contribution of the, this third body*, if the third party is just as open as you are, then you are just going to create something great, if you look something very interdisciplinary, because it's not just how you approach the topic but.....its about.... it's also how *they* receive, I think that's why, the whole fit, all these different projects, *eventually* they will evolve something very interdisciplinary..... but I'm not so sure if they are there.....

CM: So just a question, you talk about this third body, by that do you mean the different disciplines and then the work or?

█: I mean your collaborations in this sense..... I can't, I'm so sorry, I'm terrible with names, what's the guy's name, █?

CM: Yes, █, or █.....

█: Yeah, I mean the initial conversation is to work with him, to work on fibres for example, so I don't know how he perceives the qualities of fibres, so the tangible qualities of fibres, let's say, *as you do*, this is one thing.....The same case with █.....for instance, because he has so much to do and because he has a very clear task to complete I don't know *how open* he is to this type of interdisciplinary collaboration and interventions that come from you.....basically

CM: OK, and what about actually the whole project, so *not just me and █ and █ or not just █ and █*, or the context students and people who work on the technology, but if you were to think about the *longer* relationship between RCA and Imperial, and their involvement with Fairspace, if you were to think about that in relationship to any of these? or do you think that actually it is these individual elements

█: I mean.....it has the *potential to be interdisciplinary*, with the very good communication, because they have this *human involved*, you know, it's not about the *interaction or the perception*, there is this human and some behaviour issues, there are lots of different things that they need to consider, I think if we have a *very good* communication with them, I think this relation, this type of collaboration *can be interdisciplinary*. I don't think that the field that we study at the moment is transdisciplinary.....I'm *not so sure it will be*, I think for me all this Digital, *all this tangible digital interface, will be transdisciplinary one day*, it will be something.....like wellness....you know like product design or textile design, this could be something else, *I mean all this digital, tangible systems, soft systems, smart wearables*, I mean *whatever they are called* I think it will be *another discipline at the end and I think it will be transdisciplinary*, but I mean, there is still.....there is *still time* for this type of evolution. I think our relation, I mean RCA and Imperial, *could be interdisciplinary*, but for me right now it's more like cross disciplinary, so we are trying to understand what we mean and we are still trying to navigate *how to work together*, so...but yeah, I think it all depends on the *time* that we spend and work together.....

█

CM: Ok so next question I have █ is what do you think that the textile design discipline can learn from these types of projects? So what do you think *we could learn from the collaboration with Fairspace*, that perhaps in many ways is continuing but perhaps in other ways it is also kind of drawing to a close... contracts are finishing, what do you think we can learn from the project??

█: hmmm very good question.....um.....I think..... I mean for me as well, it's just, I think, for each discipline you understand that there are some *restraints*, so these restraints sometimes could be a very *specific function*, sometimes could be a standard or sometimes could be a protocol *to follow* and it's not very common in textile design, *let's say*.....For sure you have some standards, I mean you have to have some standards if say you produce some commercial fabrics, where you have some standards in terms of the durability of *the fabrics* or washability of the fabrics and these sort of things, or sometimes for the sustainability of the project, but sometimes in*these e-textile or some type of these smart and intelligent system design*, I think for a textile designer, its....its a good thing, *it's a very good lesson*, to understand that

there are some concerns and this is a very good lesson..... if the function doesn't work, basically you end up with a *very fancy*, but just a fabric.....so this is one of the first things, so it is a very different sea to swim.....let's say, because you have some *restraints* which comes from the technical part of the prototype of the design but also there is this fluidity that *you can*...you know, it's up to us, it's up to you how you are going to construct the piece and I think it's a good thing that you have this flexibility.....but I think it's a very good terminology..... to understand about the material nature of the material characteristics, the softness.....the hard and soft..... and I think it's a very good thing because it shows an understanding

CM: sorry could you say that again?

█: I mean, the expression of this hard and soft, I think it is a *very good* expression because it doesn't only describe the material characteristics or the nature of the materials, like in designing e-textiles you have this hard part *which is the function that you can't leave behind, this is hard and this is your restraint*, I mean you have to somehow eschew it, I mean the output might change but you have this and you have this soft partthat youand this fluidity this type of flexibility that you can play with.....

CM: What do you think the broader implications of this type of research, for example, textile designers and these scientists working together, like....why are we trying to do that?

█:I mean, I don't want to say this is the future, but this is the future, ahah....there are lots of issues, I don't think we can let's say....afford external and personal devices one day, I mean there are lots of issues in terms of sustainability, but I am not talking about the sustainability of polyester, but I am talking about the sustainability of some metal elements.....let's say so it's just...*maybe one day you can't afford personal computers*, it's not about the technology itself but its about resources *that we can have*, so we have to *somehow*, you know it's the same in this automotive industry so maybe we have to look more like, you know like the *shareable* things, it could be like a autonomic car, *but who knows?* maybe we need to share computers and then we just gonna plug, you know, we will be the source of personal data, you know for them textiles is a very good platform to engage with, I mean textiles will *evolve there* and somehow it is just going to intervene with technology more and more because I think the textile production itself is very affordable and its very *scalable* but at the same time *it is very personal*, or could be *very personal*.....so yeah, I think, it is just about the future, but I think the demands will change.

CM: So is it kind of like it is going to happen anyway so we should be...

█: Be prepared? ahha....It's not about be prepared, it's about we should have to understand *how to work together* because it looks like we are going to look at the intersections, that no one knows *how to**you know...how to* cover, I mean there are lots of, I mean it's a very common thing in Medicine let's say, especially in the Aesthetic part, so everyone, I mean there are some, the surgical operations in the face that no one wants to take responsibility.....who is going to do it? Is it going to be the dental surgeon who's gonna do it or the aesthetics surgeon that's going to do it? like this type of gray areas in medicine, I think will be applicable to this *digital, tangible* fields.....

CM: Do you mean what the reconstruction might look like?

█: I mean like, *who will be responsible?* Who will be responsible in designing this type of tangible system? Will it be the *computer scientist?* or the *electronics engineers, or the textile*

designer, who? You know like, so there will be another professional...you know another professional body will take the, yeah...

CM: Ok, yeah and my last question is what are your hopes for the future interdisciplinary projects between textile design and scientific disciplines?

█:I think In the end I think it will be *fantastic* to see something, that since its a very project, you know its a team effort, so I think it will be good to see *an output* that you know, you cannot do it by yourself, you know someone will cover the *technical* part, someone will cover the *characterisation*, or the simulation part, which you know, usually you do not have to be involved in but at the same time.....it is there something has, promote all this functions but at the same time *practical and appealing to wear, or to use or appealing to wear or pleasant to touch*, lets say, something like that.....

CM: OK that's great, do you have any more thoughts on any of the things we have discussed or...

█: I mean, how....*how are you doing?* how do you feel about your experience at the Imperial so far?

CM: I mean...I feel..... it's quite interesting, because.....in many ways.....█ has expressed a lot of interest in continuing some of the work and working together, so I am thinking for myself, have I, is what I have done enough for the PhD? and maybe there will be opportunities for us to continue working.....but I *just feel* that the timelines are very interesting thing really, because I think it takes quite a lot of time really to *understand exactly what the other is looking for*, um...yeah... I mean..... I think for example, I would have liked to be introducing more advanced materials into what I was doing, um.....whereas, I kind of *have been working on*, like the thing with █, that was very early....you know.... we got some fibres, but then it *didn't go much further*, but I think going forward, that would be really interesting work to continue and the same with some of the work with █, where it would be *a really interesting experience to really start to combine technologies*, so using some of the cooling systems but then also integrating more into the fabric, so that it kind of has a bit of both, um.....but um, yeah I don't think it's really at that stage yet and I don't know how long it would take to develop *some of those things*

█: So how do you describe his contribution? Just introducing the concept part? Or is he *constantly* involved in this design process?

CM: Um...not really no.....but I think he was *too busy* to do that, I also interviewed him which was *a really interesting point actually*, because I think I could ask him some of those things and he said oh you know, he was very busy, and I already thought that you know and also that he would have, in one of his regrets or what he would have like to see more of he said he would *have loved to have been able to commit more time to it*, so I think in many ways he introduced a concept and then in terms of the actual device that will work as a pump, I mean..... I haven't seen it, I'm just thinking it will be added to the pieces I have done and..... but then he also helped with you know....put me in touch with the suppliers *who make the tubing* and placed some orders and *pointed me in the right direction of some literature* and stuff like that, so I think in many ways, it has very much been a springboard into that area and understanding this area of thermoregulation in space and the type of things that they are doing but *also* I am aware that integrating the

liquids with the tubing as a cooling system is also something that they have been doing for *many, many* years and I think that the integration of advanced materials that could be working either in collaboration with or replacing these technologies is probably *more.....* the cutting edge area, but then they are not from a material science background, so..... for them I'm not sure how aware they are of what that can do and then I'm also not from that background so I don't know exactly how to do that by myself, so it's kind of like this..... I feel like I now know this area and what it needs, but yeah...I don't know if that makes sense.....

█: Yeah, yeah perfect..... its makes sense, it's just this is one of my regrets to be honest, you know when I started the conversation with █ or █ you know, afterwards...I *wish* that I had had this conversation with █ and then █ that you need a supervision team *or like*, someone needs to you know, like..... work with you very closely.....so that's what I understand what you mean by springboard, but its like you so you need this springboard because you know sometimes it's so difficult to find your.....*weave your way out actually* because there are lots of uncertainties, so much things to discover *right?* I mean this is the thing, this is one of the things, maybe when I started the conversation, and when we you know, when you started your residency, so you need to.....it doesn't have to, I mean █, he is also very busy, I mean we can't, he can't basically commit time, I mean it's not practical, it's not feasible.... I can totally understand it, but maybe someone else, a couple of hours for █ time or someone else, so that they can at least closely work with you or they can at least can be, you know have this *constant monitoring* of your progress, so it will, if you have *this touch base*, so then you will show a larger leap *lets say*, and not have to figure it out by your own, you have to figure out the facilities, I mean the access and even just like this paperwork, this financial paperwork you have to deal with it by yourself and ask people..... and it takes time, and I mean it takes time from your research time and it is....

CM: Yes... all quite interesting, and for example █, you know because he is working on a *PhD* he is so in that, that's his one project, so in many ways, I wonder if I, I wonder if it would be interested if I had got straight involved with that project because he was so so into it, rather than█, you know, he had done his PhD many years ago he is involved in *multiple research projects*, so there is different things, so that is something that I personally would think about myself going forward, like at what level the other person is at and that people are having the same level of commitment to the project....

█: I mean thats *why* its like, like this is one of my regrets, we asked them to cover your time but maybe we need to also, *extra cover some of the staff time*, either █ or someone else, it doesn't have to be a day or anything just a *couple of hours per....you know like per week, which is amazing you know*, if you just talk to them, I mean every week just for one hour, so that your job will be much easier, *but* you know, this is a lesson actually, thats why, it's a very *dynamic process let's say*...you know you take the next step based on your experience and..... this is one of the things that I realise, especially in your projects.....because..... █ yes, he was involved and *he knows what to do* and he had a very specific brief to follow and so it was much much easier for them to.....distribute the role among them.....

CM: But also I mean they had a slightly longer *time*, like two people working on the project, so there is a few things and *still it is interesting*, its given me a lot of hopefully good things even if it is not totally.....yeah, yeah I think it has still been a *really good*

experience for me and I am still grateful for it and I think there has been a lot of learnings so...*hopefully its fine* and hopefully it is enough for my PhD, the things that I have, but yeah.....*Ok* well that's all of my questions, thank you so much [REDACTED]

[REDACTED] *Thank you for having me [laughter]* thank you for having to deal with all of this noise.

Interview no. 7

CM: OK...well...so...the first question [REDACTED] is just to ask you if you would introduce yourself and your role at the Royal College of Art and then just tell me a little bit about um, sorry can you hear me?...

[REDACTED] Ok, I've lost you

CM: Sorry.....OK, I've got an ethernet here that I can plug in because the WIFI is not the best...

[REDACTED]: OK.....

CM: There we go..so I'll just start that one again. Thank you [REDACTED]. Ok, so the *first* question I will ask you if you wouldn't mind, is if you could introduce yourself and your role at the Royal College of Art and then in what capacity you were involved in the Fairspace Project?

[REDACTED]

CM: So..... do you think that was, I think you mentioned it at the beginning, but one of the key drivers from the RCA perspective, as a kind of conduit into this space, as a reason to want to work in that, and you described it as an opportunity....

■ So.....sorry can you repeat that, because I'm not quite sure

CM: So do you think, is that one of the reasons why you feel that RCA textiles wanted to be involved in this project at Imperial, as a kind of opportunity for textiles

■ Yeah as an opportunity to generate more demonstrators if you like, an opportunity to *demonstrate* our capability and the more that we can demonstrate our capability then the more we are going to be able to *grow that area*. So yeah, I think it was good and I think even though the initial opportunity was *quite small* I think that also demonstrates that even if you are given something small, hahah, like out of a little acorn you can grow quite a lot if you are prepared to be open-minded about it.

CM: Yeah, definitely, and then what do you think about in terms of the development of the students maybe who were involved in the project or the alumni and researchers who went there, did you have any expectations or hopes for their development through the project?

■ Well, I had both hopes and expectations, I mean, all the people.....all the students..... yourself and the MA's who were involved in that were all high, *high calibre*, so I had a lot of *faith* and *trust* in the people being involved in that, that they would be great ambassadors for the textile program and what textiles *could do*, so that was like no.1 like ok yeah that was in fairly safe hands and also one of the, the reasons for wanting to expand the activity within the textiles program is to *extend* the career opportunities of our graduates who come out of that and having worked in....in textiles myself, haha, for many years I have witnessed first hand and seen people as well you know textiles *being very much a poor relation* and *really not great in terms of salary and opportunity* and things like that and that just *never sat easily with me*, that that was and *I've never really accepted that*, so that's taken various forms, haha, in terms of running my own business or you know whatever, in one way or another of doing it my way, of not accepting that that status quo should just be the ways things are and that you know it's possible to challenge that, so you know, I wanted to, *I want to see and am seeing now* a much broader range of work that our grads can go into, which I think is *great* and that in turn makes more people more interested in the discipline and want to engage with it and *do more things with it* and so I think it's great from that respect but yeah so, students that...*are much more*, I mean now *we have much more engagement with research community* for our masters students, whether or not they are going on to study PhD themselves, or whether they are going on to work as research assistants on projects and things, but I think yeah *their awareness* of what is out there has grown..... and they are responding really well and *are doing some really interesting work, really interesting work!*

CM: And what about from the Imperial side, did you have a sense from any of your kind of early engagements, maybe you mentioned it a bit before about, you know you think perhaps they just wanted to just have someone to make something up, what do you think were their initial expectations or hopes?

■ I don't think they had great expectations *for us at all* because *they didn't give us very much to begin with at all*, we had to prove ourselves to them, so they gave us just a *tiny* little job, quite straightforward and easy with that shirt, they just gave us *a tiny little thing just to see, to test us*

out, you know how reliable are we, what was the level of our expertise, what were our *capabilities* and this is a very prestigious project, you know you are very well aware about *the amount of money that's in it, the number of partners that are in it*, you know its a *significant* thing and you know, Imperial have their own reputation to safeguard, so they've got to be *very sure* that anything that they are handing over to someone else to do is going to be done to the level that *they need* to maintain their position and so yeah, you can't just sort of *get that trust*, those relationships have to be built up, so you do take any small opportunity as a way in and look to build on that.....

CM: Ok, so based on that I'm just going to share my screen with you, if you don't mind, I will show you a diagram, perhaps you have seen it.....and just ask you a little bit about um, your thoughts..... on what type of um...collaboration was happening at the...so if you see these different types of....ways of working, if you think about that early prototype that you were involved in where would you think that it was placed along these...um...

█:I would say..... its a bit of multi-disciplinary.....and a bit of interdisciplinary....

CM: OK yeah, and if you were to think a bit about, perhaps, maybe how you might like to see these types of collaborations happening.....

█ Um...transdisciplinary

CM: Transdisciplinary, ok yeah, so kind of building

█ I think you have to.....you have to work towards that..... you know, so I think,.....I think we are now *more* in the interdisciplinary space, *where we are integrating knowledge and methods from different disciplines using a real synthesis of approaches*, so when I look at the presentation that █ did, *for instance*, when I look at that, I think that is a *really good example* of interdisciplinary work, where they are *all bringing different things to the table and integrating those, separate disciplinary knowledge* and integrating it so the er...the original one, was it, *would it even come under the cross-disciplinary thing to begin with*, where you had, viewing one discipline from the perspective of another? um...where....*its not really*....it's....

CM: It's tricky.....

█ It is tricky, working within a single discipline, it wasn't that, people from different disciplines working together, each drawing on their disciplinary knowledge, *OK, so maybe it was multidisciplinary*, I think it started off with being multidisciplinary, er...*where*, if you *look* at that diagram, so say you have the Imperial College Fairspace people in that circle *in the centre, the centre point* and textiles was one of those, um *dots*, around the edge so they are kind of reaching out to us, there to say, *oh ok and can you with your disciplinary knowledge with embroidery and putting things together*, can you work with us, on putting this thing together and *we will tell you what we know and what we need, how it has to happen and what its got to be like*, yeah, so it started off as multidisciplinary and I think.....it's..... its now become *interdisciplinary*, so I think there is now *much more integration* and *much more value I think*, and...I guess one of the interesting things to ask one of the people more involved, more heavily involved in the project and carrying out things is to....you know to describe that journey when they first started and what it is now and what were the, what were the critical points when they were given another task to do *or you know*, another bit or something else.....

CM: Yes, ok thank you. So I guess.....this has also perhaps been covered a little bit but just like more *broadly* on these types of projects but what can we learn as a textile design

discipline from these types of projects? to go forward um....either into other projects or just for the discipline itself.....what are your thoughts on?

■ I think what we can learn from those is the.....the breadth of our subject and *the breadth* of our discipline and we do, you know we always say, *it's very broad it covers a lot of stuff*, and yes, it does.....peoples use of textile and *textile type* materials from sort of papers, you know *it's not just fabric and things*, and you know *a whole range* of soft things, and actually some of them not so soft, either, *at all*, actually.....when we look at that and how those materials are used in the world, its enormous, but the space that textile designers occupy that *is a relatively small fragment* of what it could be and I think *it's really useful* to free yourself up from some of those *early boundaries of what you discipline is* in order to *liberate your creativity* and almost give yourself permission to work in spaces that aren't *textile*, you know there is a certain amount of *permission* there, and it's about permission and permitting yourself, I've got a couple of *very good examples*, there was a student, not at Royal College, it was a masters student at ■ who had studied printed textiles with fashion at her undergrad, she was ex st. martins student, she was great, *really good*, and she was working on something and she kept trying to *force* an element of printed textiles into her project, and I said to her look *just forget your, you were ever a printed textiles person, forget it, you've done it, its history, just leave it, let it go* and just think about this as if you have a *completely blank* sheet of paper and she *turned around to me* after she had completed her masters and she said that was, that conversation that we had *was the turning point for her*, it was a really *critical* point for her, she felt, she didn't feel like she had to anymore to *identify herself* as somebody who *printed a pattern*, she gave herself *the permission* to leave that behind and so I think that's really importantand a really critical thingand the importance for me..... in terms of trying to get a larger segment of the work market, if you like, for my grads and *a more prestigious and valued understanding of textiles as a discipline generally* is exposure to these *other, other* projects and approaching things in different ways, where you are *removed* from being the person who does *the sewing, or the printing or the knitting* and really removal from those *understood* norms in order to free up another thing and that works two fold really.....it shows other people the....the..... potential of what you can offer and it also *liberates the individual* by giving them *permission to do something else*.....

CM: I think that it is really interesting to link this idea of *permission*, and I don't know if I'm hearing it right, but also this idea of confidence through exposure to different areas.....

■: Yes, *absolutely, absolutely*..... so um, the language that is used in different areas as well, and that is *really critical* and actually, you really do just have to really *put some time* into that and you, it's like learning any language, *you have to put some time, invest some time* into understanding how people in another discipline communicate and *what they mean by the words that they use* so that you can engage with them..... on their terms.....*you're....you're the one knocking on the door, wanting to join the party* and so if you are doing that, you've got to be able to *play on their terms, at least to begin with*, to um.....until there is *a bit more understanding* and you build a bit more of a relationship, and so that was something I spent *a lot of time doing* when I was at ■ and realising *that the language that we use to describe what we do and what we can do and our potential, is of huge significance* and being able to understand enough of somebody *else's* territory and their language so that you can actually.... join

in.....you know so that you have something to bring to the table... that it isn't something that they *thought* you could do at the beginning, because you surprise them with something new.....

CM: And do you think, [REDACTED] that exposure to these areas or learning someone's language or entering into their territory or whatever it is.....do you think that that has to be, or is something that could be done within the confines of the RCA itself? Or do you think that students or researchers have to go into other environments in order to experience that. I guess I'm just *curious, you know about these sites* and how important the placement of you know, meetings or briefings or um...

[REDACTED] I think it's really important to.....to go *outside* the college and I think that is really important for *many different reasons*. The RCA is *essentially* a single faculty institution, if you look at some of the larger universities, you know all of art and design is in *one faculty* together, you know, its...its not split up into these different things, so you know the way the Royal College community there....there.... is, it's *a really unique thing* and a really special thing..... It's an incredibly sophisticated and nuanced single faculty and so, I don't think any other faculty of art and design has *the breadth of what we have there*. Um...and *sure* there is a certain amount of breadth within that, but I think if you are really looking to push *outside* of that territory then you do need to go into somewhere else *completely*. It can be geographically.....but it can also be just in terms of *attending*attending conferences or lectures or things, where it is a very strange language, where you *understand* how people present in those spaces and you understand what's important to them and how different it is to what you do, and that does help you to value the things you bring to the table but also it *can be very unsettling because you think...owww....I'm not like that. Haha* It's *very very* different and how do I become that, so *I think it's really, really essential* to move outside of your discipline, *really essential*.

CM: Yeah...and do you think, when you talk about it allowing you to think about what textile designers are bringing, what do you think that some of those skills *are*? if you are going in to working in another space?

[REDACTED]

CM: Ah don't worry, I thought that was my WIFI actually, I was like, oh dear..

[REDACTED] Yes, it is a little quieter...so...skills, what are the things that we bring..... we have um.....a kind of *fluency* in a material language.....and I think, and *of course* I'm bound to say this.....I mean we are not the only discipline that has this, but its not.....its not.... kind of *equally distributed* across the design disciplines, and also textiles is, it's not just about design, of course at the Royal College it covers *all kinds of things*, from Art to Design.....I think a *critical* part of the way that we work is that *we are not* predominantly, or we are not *solely* problem solvers and I think a lot of design disciplines will say..... *you know start with the problem...well there is no problem*.... so.....well what do you do when there is a curiosity and a speculation. So there is a different way of uncovering knowledge and finding things out and I think it's also very much a sort of..... hand and head connected approach..... but I don't think it's *limited* to tangible things and I think there is a really interesting space in the *digital and the virtual* now as well, but that's kind of emerging, but so, what do textile people.....*what are their special things*, it's quite a difficult one

CM: I know, it's a difficult one, sorry, sorry....

[both laughing....]

■ You know, I think if you are looking at, or to what textiles can contribute to something, it's probably, if you look back *in a few years time*, if you look back at the previous ten years of PhD work that are being done by RCA and some other ones as well.....I think you would *begin to see*what's identifiable as a *clustered* body of knowledge. At the moment.....textiles research, in terms of, *you know the PhD in textiles*, that isn't about technical textiles, I think it's still fairly small, when we think about how *large* some of the other areas are..... and the body of work that has gone in.....in textiles is still *fairly small*, so you know, you are just probing into textile thinking and you know it can mean anything from something really quite superfluous to something quite interesting..... but they are not....they are no..... *fully defined, they are being defined* and its in process..... and I think if you take a string of things, probably starting with somebody like Elaine Igoe and you start with her one and then you come up to the people that are currently studying *and the ones who are about to start*, if you then *looked back*, in you know, five years time at the body of knowledge that has, will have come *just from textiles RCA*, I think if you look at that, then I think you will be able to begin to *identify what it is*, but it is very much still in the process of being identified.....

CM: Yes, yeah, and what do you think, if any, are the broader implications of these type of relationships? like beyond the textile design discipline, or beyond Fairspace, why is it important that actually.....or is it important that Textiles collaborates.... with people who work at Imperial, beyond extending career opportunities, do you have any thoughts on...?

■ Because...um...because there is a slightly different way of looking at the world and *that* contributes in ways that we don't necessarily anticipate or expect.....and I would use Marion's project as a really good example of this..... of using that sort of, tactile, material very textile way of exploring a subject matter that is informing policy andandpolicy decision making and so *there definitely is a role* and it's not just about providing *more jobs* for people but I think it's also, it also is building *an understanding* that perhaps *is more holistic through broadening something* it actually becomes more inclusive *of people's differences, the differences in the way that they learn, their differences in the choices they make, the differences in the way that they live their lives*.....you know it's *not so much that there is a right way that you must adhere to or else its the wrong way*, so it's about contributing to a *broader more..... holistic* way of understanding things

CM: Yes, ok that's great and then just my last question is about looking back over at the Fairspace project specifically and interactions..... or it maybe could be to do with setting up the MA projects or setting up meetings or anything, if you look back, is there anything that you might have done differently if you were kind of to approach it again?

■: With regard to what, just the Fairspace project, or just textiles at RCA?

CM: Just Fairspace....um

■ Um.....no only that, you know, if I could have done it earlier *I would have done*, if I could have done it sooner, *I would have done*, but it needed an opportunity to be able to....um... do that, with the *benefit of hindsight I guess*, um, perhaps we could be *more confident and inviting people in to see what we do* and open our doors to other people more....you know..... to sort of show what we are capable of I guess.....

CM: Ah ok, so perhaps that is one of the things that would be taken from the Fairspace forward into other projects, I guess?

■ Yes, yes, so for example, a way that, it's only a *little tiny way*, that it has informed other projects, it informed the way that ■ and I ran the grand challenge.....so we *very much* had the material-led workshop that was a really important thing and also in terms of getting people to understand each others working spaces..... so..... I think we had, I think it was a day set aside where you had to tour everybody's working space in the team and....and that was sort of one of the things that you did, rather than sort of coming into a *room* and putting your post-it notes upit was a little bit about here's an opportunity to get a little bit under the skin of other people and a little bit for people to understand a little bit about what you are about as well. So a bit more....*a bit more sharing*....at the outset.

CM: Ah ok, and how was that inspired or informed by the Fairspace project?

■ Um.....well just that you..um...*it wasn't just* Fairspace but sort of all of those things that I've spoken about and so that if you are wanting to work with another discipline.....in a way, whether it's something that is quite close to you or that's way away from you, you need to.....have a certain period of... of.....learning and sharing and *understanding* in order to maximise on the potential that it brings..... so for instance the Fairspace people didn't ask us to do all of these things to begin with because they didn't understand *what we could or couldn't do*, you know they didn't and they didn't see how those things were relevant to them, or how those things could transfer across, so you.....you have to develop some understanding *from each way* and that might be from someone who is *seemingly very close to you* from IDE or Design Products or something, or someone *who is way, way away from you* and deals with I don't know creating *enzymes* or...or something like... I guess you *expect* it to happen with, you know if you are working with an enzyme chemist, then you think, you know we're a million miles from them so I am going to have to be prepared to do a lot of that, what *you are not prepared to do*, I don't think sufficiently, is when you are working with somebody who *you think is speaking the same language but they are not*, so you know IDE and service design, so that was just really to just.....allow that understanding and seeing things in order to maximise the creativity

CM: Yeah.....well that's great, I think that is everything actually

Interview no. 8

CM: So um yeah...I started before Christmas really and I mean, it has kind of been quite slow going really, so i think it is maybe at the livelier point and I may actually continue collaborating with ■ actually, but yeah I just have to figure out which bits I actually *need for my PhD* and which would be things that I would keep somehow.....in the works to keep working and all of this, I'm still at the point where I am just calculating how much I need to be writing each day.....

■: Oh ok, are you writing up now, is that?

CM: Well, I was *finishing* this practice so I'm about to start, after I've done these interviews, these last.... sets of interviews and then analysed them, then I'll really move on *to writing up, writing up* [laughter]So I know you don't have that long, so if you don't mind I'll just jump right in, but... my first question, ■ is just about, perhaps me asking if you can introduce yourself and your role at the Royal College of Art and in what

capacity you were involved in the Fairspace project that took place between Imperial and RCA.

█: Yes, sure, Yep, Yep, so my name is █ and I work as a █ at the Royal College of Art in soft systems, █ so at the time of the Fairspace project, █

█ working with █ in soft systems and my role was really to take care of the Futures project so I think █ set the collaboration up..... and essentially I wrote the project but the collaboration had been set up andddd we kind of *came up with themes together* and yep, me and █ really wrote it *together* and █ really provided quite a lot of contribution to it as well.

CM: Yep so that was for the MA aspect of it?

█ Yep, for the MA's.....

CM: So I guess, um, my question was a little bit about how it came about but I guess you have talked about how █ were setting it up....

█ I wasn't really *involved* in how it came about if that makes sense, so I was only involved in the execution and delivery of the module....

CM: Yes, so did you meet with the members of the Fairspace... or members in Imperial in setting up the brief.....or how ... did you come about thinking about what the brief would be?

█ Sorry, I'm just trying to think it has been a while...I've just had so much stuff happen since then.....[laughter]

CM: [laughter] don't worry....

█ So we did meet... from what I know.... █ had been working with Fairspace, or maybe with █?.....and █ on..... you know their exoskeleton..... was it █? Sorry, it's just quite long ago....hahah.

CM: Well, █ was doing the T-shirt with the embedded sensors...

█: Yes so they were working on the T-Shirt.....with kind of like the sensors, you know.... with the ECG sensors etc. so thats...so █ was setting that up and I know we had very brief meetings with them, I was working on some other stuff at the time.....so yeah I did meet them.....but *really* I think that they came with three technology challenges to █ and then we integrated that into an overall contextual brief... so that it could be in *some way accessible* to the MA students, just so if they were having these technology challenges, so they knew what they were, it can be quite dry for them so we really needed to kind of couch it in a context and sort ofmake it interesting.

CM: OK, so the technology challenges when you developed it into a brief for the students, um.... were you thinking that they would be able to have access....to....people at Imperial to discuss their ideas or was it more of as a kind of spring board?

█ It was *definitely* a springboard, like a platform, um.....we thought that yes, they might be able to see the space, which is great, they might be able to get a taster, I think it was also the opportunity for the students to really have access to...I mean, amazing minds at Imperial, who are developing cutting edge research, so it was really for many of them to have that, to really start those connections because many of them hadn't worked with a scientist before, never mind working with Fairspace.....

CM: Ok, so my next question is, at the early stages of the project, did you have any particular hopes or expectations..... of the development of the RCA students, alumni or

researchers, or whoever was involved in the work.... and their work..... as a result of being involved in the project with Fairspace?

■ How do you mean?

CM: So did you have? Um.... before it was starting, as it was being set up, what your particular hopes, or expectations were for the development of RCA students was? Like, what did you hope that the project would bring them and their development?

■ Oh ok, so I suppose it was meant to give them a new set of tools and introduce them into interdisciplinary way of learning and....er.... I think...well for one particular student she was joining soft systems so I think, we made, that was *mandatory* for her, just so she understood a bit about futures, um...and I think it was kind of to develop their skillset in terms of actually working.....you know with a *technical* team, working on something that was also *technically* challenging and could push their work in a different direction

CM: Ok and do you think that these, those expectations or hopes were met, through the project?

■ Yeah! I mean *it's hard to say in an 8 week project*, really

CM: yeah true.....

■ yeah it's an 8 week project so the idea is to give a *taster*, not for them to save the world.....hahaha

CM: yeah, no, no...and then did you see, have you seen, since then...perhaps in the students work.... influences..... of this project?

■ Yes, *of course*...what was really nice, because my role I suppose in this project, as a pose to the last futures project, *which I wrote and delivered as well*, was much more hands on, so I was working with the students, tutoring the students throughout, keeping them updated, if they had any *sticking* points as well, and I think that one student might have had a sticking point in that she felt, initially..... in the initial lecture that she was being *told what to do* by another discipline

CM: Oh ok

■ and we had to say, *no no no*....we are in an art school so you have to approach this in a very creative way, you are not being told what to do. But then other students, you know another student ■ she....really found that the project opened up a whole new type of practice for her, she had struggled with her unit 1 and unit 2 really opened up and I think she became one of the strongest students in the year, and even in her *final* project, it's all to do with *space and all to do with travel*, you know....so that really became a sort of theme....

CM: Ok, very strong...

■ Yeah and then I guess it was really great for a couple of the second years in terms of a couple of the second years, it became a springboard and they became research associates, research assistants...

CM: yeah, they became involved even further in the fairspace project ...and then just going back to the student who you said felt like she was being told what to do...what do you feel, what do you think it was that made her *feel* like that, did you have the opportunity to discuss it with her?

■ Yeah...we had a long tutorial with her and I mean, *I know*, being in that environment for a long time myself, it's just the language.....you know the *language of the discipline*, you know...they announce what they are doing, and then... the whole idea of solving a problem. You

know Elaine talks about for ages in her literature as well and I think.....you know, in that sense think textile designers don't necessarily *go out to solve a problem* and you know, she found like, I suppose she didn't want to feel like she was being *told to solve their problems* and you know I think maybe it was the way it was done, if I was going to do it again, I would make the whole introduction very much of a hands on process, which we did that in our futures project this year, we set up a workshop and.....you know.....it became very involved, and they were, you know they *were actually making things*, whilst, I suppose our initial introduction with Fairspace, they gave a lecture.....and also you've got to think of the context, *so this year, we were in a print room, it was very much in their home environment*, but when we are in a lecture theatre, they are giving a presentation and they are giving these *demonstrators* of a technology and it can be quite hard to imagine how you might work with it.....yeah...

CM: OK that's really interesting....

█: yeah it is very interesting

CM: Ok, so um...do you think that um..from your early interactions, that there were any expectations from the Imperial side as to the type of, how the work would go?

█ No, I think they were quite open, I suppose what some of them were looking for....actually I do know, I remember speaking to █ about this and demonstrating some of his wearable pieces and he really struggled.... with....maybe.... you know obviously, the making side and the exoskeletons and he really just needed some help with that and with *execution*, um....but they were very open and when it came to the end, you know the group critique we had everyone there and we had █ there and I think they were kind of *blown away* about how their ideas were interpreted....so yeah they were really open to that, I do think they were maybe looking for more...they were really looking for research assistants or research associates, which they did get in the end.....

CM: well yeah, I spoke with █ about it actually and he also mentioned the final critique...and how it really left an impression on him..... so.... that was great and I think they definitely really enjoyed it.

█: Yeah I think it was great.... because I think it also challenged my expectations, because I also had *assumptions* about things like, oh they are going to want things that are really *practical* and they were really nice, and everyone was...not nice but *open*...

CM: OK, so my next question is....what do you think that the benefits of this project have been to the...those in the RCA textile design community? So that *could be* the students themselves, or some of tthe alumni who went to work at Imperial or *researchers or staff*? Do you feel like there are any particular benefits with this project?

█: *Yeah*, I feel like from the staff benefits its opened up a new collaboration with Fairspace andI think, I think it's really good for kind of paving the way for *potential careers even*, for where students might place themselves in a futures context, like right now, right now we've good examples of Lauren's work, she's a free standing artist, in a sense, you know Laurens Bowkers work, it's really nice to see opportunities, you know, that *you can go and work in a lab* and your skills will be valued there, so that's been really good. It's always good for students also to work within a different context as well..... so I think it's a nice example of a futures project...sorry I can't think of any others really off the top of my head.....

CM: No, yeah that's great....what I was gonna say, sorry let me just see where I am....so I guess I'm interested in what you just said about their skills, that they would be *valued*

within these spaces, what do you think...if you were to describe...what some of those skills are?

■: *Oh*, I think it depends on the different laboratories they go to.... but I suppose there is obviously the *making and the execution* which textiles is well known for, but I also think it is possibly a different way of designing as well, *you know, designing through making*, potentially *different ways of problem solving*, also a different ways of approaching even something alongside the concept of *interaction* you know, why it might be used, also *sensorial* qualities as well, you know using a multisensory approach, but again, I don't think it's anything that has been solved yet..... maybe new spaces will open up. Because I think you know, obviously..... the way somewhere like Fairspace works or somewhere like the RCA, are *very very disparate*, or somewhere like say, I don't know..... I mean *somewhere like IDE and the Dyson school of Engineering* they are a little bit more close..... so I think some of these spaces will begin to open up.

CM: Yeah, so making those connections...

■ Yeah...

CM: Ok, and then the next thing, you have kind of already led into it....but what can textile design as a discipline and perhaps textile design at the RCA..... learn from these types of projects for.... you know future projects or future....yeah.... ways textile designers will develop into this kind of evolving landscape?

■ Ummmmm, *how*, sorry can you be a bit more specific?

CM: So I guess I'm just asking what do you think the *discipline* can learn from this.. these types of projects? Perhaps you answered it a bit before, about it kind of paving the way for these different types of collaborations, but

■ *Yeah*, I suppose maybe, I think it would be good to know, I guess from textiles, maybe just to see what other disciplines *value* and I think um....the next step *logically for me*, is textiles the discipline is about to learn things, maybe even *writing joint papers* with Fairspace, and actually starting to develop this new post digital space...I guess for me maybe it can sometimes feel a little *siloes*.....even though they are working together, you know, you've got your role, you've got your role and maybe even starting to develop *collaborative methodologies* rather than.... collaborative roles *you know*.

CM: OK, so based on that, I'm just going to quickly share my screen with you and ask you...if you were to think about these developing models for collaboration, what you might think.....what might be..... potentially.....thought of as the most effective ways to work together, between textile design, when thinking of textile design and perhaps Fairspace?

■: uhuh.....so which ones you say?

CM: Yes, so what are your *thoughts* on what might be the most effective model for collaborative working in these types of projects, like Fairspace, that we have been discussing?

■: Well I think...something like, *actually you know what* I think it really depends on the length of the project, if I was going to do another *8 week project again*, you know, like for example, it would depend, you know, your work, where you were placed within a laboratory, a lab for, I dunno, 6 months is very different to you know working with 6 students *who don't really have that much contact* with Fairspace.

CM: Yes of course....

█ So it depends who. I mean I can give an example of who, so for example, if I were thinking about my MA students I would say cross-disciplinary, viewing one discipline from the perspective of another, building *empathy* for the other, a mutual respect, almost even having a workshop where you pretend you're the other discipline how to, *just to really start to learn* and then you write down *your* thoughts, or I don't know it could be something quite interesting, really from the start to build a mutual empathy and respect.....

CM: yes, I think that is amazing way to talk about it, building empathy with others....

█: I think later, I guess, what might develop later, is interdisciplinary, *integrating knowledge and methods and synthesis*, but that comes a bit later, I think that's a bit too much to start of with something like that...and then *transdisciplinary*, I mean that's more kind when you are starting to write up frameworks and papers and things..OK, and I think *multidisciplinary, people from different disciplines working together, each working on their disciplinary knowledge*, that's great, but there is a barrier there and I think that's what we do *a lot* in terms of our projects, but I think we need to move to the *cross-disciplinary side*, they are more effective, more advanced *potentially*

CM: But I guess it is like you say, it depends on length of time, at what stage you are at.....

█: I guess one more point to that that I would add is that there is a slight shift in hierarchy I would guess, because if you think about it, █ is he a postdoc, █ a PhD student?

CM: Yes, I mean █, he is like a research fellow, I mean I think he finished his postdoc....

█: Yeah I think that's one step up after postdoc.

CM: Yeah....

█: Yeah so in terms of that you have to think that having finished that research, postdoc, it's very different to an MA student. So I think it could have been also quite interesting and very different, if we had MA students at the same level, you know? Because then it becomes less about hierarchy and then perhaps addresses the issue of being told what to do because MA students aren't going to, *well they'd still do it*, but ...

CM: well they are still very much in a learning space, they are on a course

█: yes in terms of a *truly* equal cross disciplinary

CM: OK, so yeah I guess on that.....I would just ask about these, for example, *the site* of where these projects took place, you know whether or not it is at the RCA or whether or not it's at Imperial. What are your thoughts on the location of the project, because you've actually already talked a little bit about moving something to the *print room* rather than like a lecture theatre

█: Yeah.. so from my experience, anything which is based within the making space had a *huge impact* on the making and on the *thinking*, so that was really *really important*. In Fairspace when we did site visits over to Fairspace this was *really inspiring* for the students and kind of, it's such a different space, I mean for them to actually see things, I mean it would *be great* if they could work there... it would have been *even better to have had a workshop* or day at Fairspace, rather than a demo and a show-around when you are perhaps more of an observer, um and yeah, I..... from my perspective, *anything* that is within a making space, rather than working in a seminar room with carpets.....

CM: OK and do you think it makes a difference whether or not it is a making space at RCA or making space at Imperial? Or is it just that this is a site of *doing*? Do you have any thoughts on that?

█: I think it is the site of doing, but I mean evidently you've got to think about comfort factors as well, students, if they..... are within their own space, they would feel very comfortable just getting on with it, I guess, I mean...I suppose the biggest difference between the two futures projects that I ran, the Fairspace project it took the students *a while to get going*, I think because they were so over-awed by the technology and so scared of maybe *doing the wrong thing* and you kind of had to push them into maybe a few making things, whilst when I did the futures project *this year*, we just kicked off with a hands on workshop, in the print room and they were comfortable straight away...so being very sensitive to their comfort levels, so I guess maybe *starting off* somewhere that they know and then bringing *them out* to other places of making a doing

CM: and was the futures project this year set in a totally different context?

█ *Yeah, well no...* it was a futures project but it was done in collaboration with um...█ you know █ from Imperial....

CM: ah ok, yeah

█: And █, one of her students who is developing these sort.....

CM: Sound?

█ ...sort of textile tool kits and we were looking at *sensors and energy transformations*

CM: Amazing

█: but it was very much to do with *the making*

CM: Amazing, ok so I guess the last question I had for you is just around...um....you know reflecting on the process.....which you have already done throughout some of these questions already but..... you know, might it have been *done differently*? did you have any specific challenges with communication? Um that you would address if you went back into the project?

█ *Yeah, um, like I mentioned* I think it would really be having *some more hands-on workshops*, I mean we could have done with some of their materials, you know.... things that they are *making* are very much touchable, makable, so just investing time in setting up a workshop. I mean I think something that Fairspace did *quite well* and that's something that I wish we had done with the Futures project this year..... but then lockdown happened, it was really nice when the students had to *formally* go over to Imperial to present their projects..... it kind of forced them to think, *ok I'm going over to imperial, I've got to present something and I'm going to have a critique and the mid-way criticism was done on site at Imperial and that was great* and that would have been really great if we had done that this year, because it would have given a sense of, sometimes I think the students need to be pushed into a sense of formality and proper ... you know cross disciplinary collaboration, *asa pose to you know, someone is coming over to the RCA to teach you about...*yeah....you know...

CM: Sorry I said that was the last one, [awkward laughter] but I have just *one* more if you don't mind

█: Yeah, sure....

CM: ...but it was just about um....for example, these types of interdisciplinary projects, *why* do you think that they are important, what are the broader implications of doing this

kind of work *between* textile design and a project like Fairspace, you know, *why* are we interested in such work?

█: *Um...* I think because essentially it provides new *avenues* for textiles, new avenues to work, new avenues to make, new avenues to think, new avenues for *knowledge transfer* as a pose to *purely* traditional routes and *yeah*....

CM: OK and then these new avenues are advantageous *because*?

█: Ah well, money, *I think*, because we are talking about economic creation, social creation, I mentioned *knowledge transfer, valorisation*. Creating *value*, from knowledge, creating, *I suppose*.....new types of value and also *rethinking* the discipline of textiles and making the discipline *broader* you know as █ always says textiles isn't just curtains.....

CM: Ah thank you, well that is a really nice point to end on and thinking about where it can go so thank you █

█: That's fine, that's fine.....

CM: Thank you, I'll just stop the recording now.....

Interview no.9

CM: Um....so I know that the... things we were working on together were just the very early stages.... but I guess in any case I was hoping we could just have a little bit of chat about some of stuff that was done, *potential for this kind of work* and also I am particularly interested in my own research in the type collaborations needed in these type of projects so maybe the first thing I could ask you is a bit about is your background..... in terms of education and professional career and a little bit about how that led to what you are doing now?

█

CM: And that was your MA work?

█ Yeah, um, yeah.... so in our case we call it a MSC, masters of science,

CM: Oh yes, sorry sorry, of course and then is that what you have continued to work on for your PhD research?

So initially I was hired for my background in MRI guided interventions using MRI as the the.... imaging modality or *the way of seeing through the patients*, so initially I was hired for that but from there things *evolved a bit*, so I am still working on MRI guided interventions or interventions that are done inside an MRI environment, but for a different application and this application is endovascular interventions.... so these endovascular interventions are basically interventions done through the blood vessels and the major blood vessels of the heart and.... things like that so....yeah basically doing these surgical interventions but within an MRI environment, they are *commonly* done under X-RAY guidance, but there is a lot of ionising radiation and these radiations are not good for the....the.... humans, so we are trying to push to a safer alternative with an MRI field because MRI does not use any ionising radiationsso it is much safer for the patient and *also the clinicians* too.

CM: Ok, and so that is why you are trying to use these fibres that

So *how did the fibres come into play?* I was developing a robotic system to perform these er, surgeries but we couldn't find any.... they usually use catheters and some kinds of tubes in order to navigate through the blood vessels so.... apparently, the state of the art catheters being used in hospitals right now are not compatible with MRI environments so I had to come up and develop my own catheters that are *steerable* and also compatible within an MRI environment, so that is how I am using this current state of the art technology which is the fibre drawing tower.... in order to create these catheters for MRI guided interventions and also *since* this tool is really....reallyer.....interesting in terms of what it holds in terms of potentials that could include other materials, in terms of *metals* and stuff like that. So while my main goal is the guidance I have been exploring other....projects or other materials, such as *smart materials* and different aspects in order to you know come up other alternatives.... in order to come up with different medical devices that could be used in other types of procedures....

CM: and then, if we talk a little bit about the fibre drawing, could you talk me through that process a little bit, like how a fibre is drawn? So you take a mold, you make a mold, you melt the polymers?

: So there are *many* ways of actually making the, so visually the drawing process starts from a thing called preform fabrication. So preform is usually the macroscopic structure that you start with before drawing *this microscopic structure* of the fibres so the microscopic structure first thing you need to decide is what type what sort of materials will you need to incorporate in the microscopic structure.... so prior to starting anythingand then once you choose the material that you desire then you move forward by....er.... fabricating this mold, or thesorry the preform. There are several ways of fabricating the preform, one way is 3D printing of polymers, so there are obviously a lot of 3d printing facilities or technologies out there that can print *plastics* so we normally use 3d printing because it is much *more convenient to get complex structures* and does not require all of the other conventional techniques which require a lot of work and fabrication as well. So we use 3d printing, but the downside of 3d printing is the layers of 3d printing sometimes *delaminate* during the drawing process which makes it difficult to draw 3d printed structures although 3d printing would be *really ideal* because of the time spent on just 3d printing is *much much* lesser compared to other conventional techniques *such as* er....molding so basically creating a metallic mold and pouring some pellets or granules of polymer then applying some heat and pressure and then basically... the polymer melts and gets processed and then based on your molded forms the structure of, thethe cross section of

your preform.....*So that's one way*, another way is people sometimes use sheets of polymer and these sheets are..... rolled and..... they are..... you apply a bit of tension on these rolled sheets and put them under heat and they consolidate into like a solid bulk polymer, some people use that as well as a different approach as well, they start with polymeric sheets rather than pellets or 3d printing *so as I said* I mean there are many ways, but sort of the easiest way we found is bringing polymeric rods already like rods that they sell on the market, *like acrylic or whatever, polycarbonate* and just drill them....and that doesn't really require a lot of processing of polymers, *it just needs drilling*, the normal drilling you would normally use to drill holes.... so..... these are like the four different ways that you might use.

CM: Oh ok, and then you would use draw kind of almost infinite amounts or would this been seen as a prototyping tool that would then later be switched to a different kind of manufacture for mass manufacture or is this process the final?

■ No this process is a *scalable* process, it is currently used for creating all the optical fibres you use for your internet and the different types ofer.....things that require optics, optical fibres. So this is a scalable process and that is the huge advantage of having such a tool you can envision.....scalability already from within your lab not to mention having a tool like this provides a platform for *prototyping*, so it is very easy and very quick to prototype different structures, *different cross sections*, whereas the other process that could provide similar *multi-lumen, multi-channel*, er tubes, are, is extrusion. Extrusion usually has a downside that it requires very expensive tooling and these toolings creates these different structures so it is dependent on the tooling, whereas, and it is very tricky to do very small tooling for *very complex* structures. So it is an iterative process, so we have shown that through the fibre drawing we have shown that you can create these multi-complex structures without the need of very complex and very expensive tooling which is a huge plus compared to extrusion so..... but obviously the advantage to extrusion is the type of polymers you can draw, you can draw almost any polymer.....but *it depends* sometimes it is tricky to extrude some over the other but in general it is easy to extrude or it is possible to extrude er.....different types of polymers whereas in drawing its a bit tricky the types of polymers that need to be drawn need to have *specific material properties* so it is quite tricky. If you are able to draw it then you can achieve really great results.

CM: Oh ok, and then just talking a little bit about the sample that you drew, maybe.... in.... February or March, is this quite similar to the type of fibres that you had already been drawing? or where there any differences?

■: So the only difference was maybe the polymer we drew, *as you requested*, you requested something that was really flexible and could be weaved through textile... so..... we attempted to work with *an elastomer*, we had an elastomer that we already knew that is drawable..... that we can draw fibres from. So what we have done is we have integrated some electrodes or wires into the elastomer in order to accommodate electrical conduction...or heat conduction through these polymers.....so that's primarily it, we didn't have too, because we have already done a lot of work on *feeding wires* and including wires in the polymers and so it hasn't been...the only problem we had was with the polymer.... we didn't really understand the polymer and *didn't know exactly* the parameters required in order to draw the polymers and so we had to do a little bit of trial and error especially with the molding process because this polymer is usually provided in pellets, we couldn't really print, because the 3d printer would require a lot of time to

adjust and optimise....so we had to go with the molding approach and molding these polymers....did require a lot of work because of the..... our understanding of the polymer was a bit *tricky* at the beginning but we were able to improve the process and we were able to get preforms without any bubbles and voids and all these defects which was a *huge plus*. So in general, generally speaking, the process was not really new, it was more getting to know better the material and testing it.....

CM: Ok...and then would you say that kind of using the fibre draw tower to draw fibres that would be used to integrate into textiles or clothing is something that you are considering as a potential avenue for your research, or not your research in terms of your research currently in your PhD, but as one of the potential avenues for what you are doing?

■ *Definitely*, I mean this process has been, MIT has pioneered in this polymeric fabrication..... so normally there was glass drawing, but this is a *multi-function, multi-material*, so you can draw very low temperature polymers and glass fibres out of them, so..... the advantage of it, obviously....one of the first applications that they thought of was *textile*, one of the first applications was medical application and also textile but textile has been really the focus of the people in MIT, *the researchers at MIT* so they have tried to focus on industries with these polymeric.....er....fibres with integrated with electronics and different types of things, so its..... it's definitely a path that people should really consider in this fibre...fibre....drawing community and I think a lot of people have shown examples.....of, including their own fibres into textile or weaving them manually or like....with their hands so it is like definitely a field to consider.....

CM: Is there one example that you particularly like, or are inspired by as you speak about these things?

■: Like I like the fibres that will heat up or cool because it might be really interesting like if you are in a really hot weather and instead of going into air conditioning your jacket already is sort of cooling you down, it might be interesting to have *something like this, I would probably buy something like this* if someone sold me this, *especially the cooling one*, so its, I think temperature controlled textile might be really *interesting*, I'm not sure how practical and feasible.... to do but the *whole idea of it*, the concept of it is really cool....

CM: You say it's not that practical, what do you, what kind of things would make it not be a practical area to pursue?

■ I mean you need some sort of..... you might need some sort of power source.....or a pump to *pump fluid*, or, so that requires a lot of hardware around it.....and having hardware makes life a lot more difficult for you.... and in terms of cleaning, like if you want to *clean this sweater* or whatever, you need to put it inside a washing machine and you have all of these things around your sweater and it might destroy these things, so.... I mean I'm being pragmatic a bit, *I mean it's really not straightforward* to have an end product that has all of these functionalities but does not include all the other tools around it like the motors and these different types of things and pumps or whatever, or a power source.....so I mean it's going to be tricky to come up with one of these things that's going to revolutionise.....the....the world of garments and clothing and so it's going to take a while to get there, so it is not a *straightforward* thing, so its, because I feel like manufacturers of clothing would really look into how *practical* this solution is and whether this would *definitely* incorporate, incorporating such functionally is

needed in the first place? and whether it's doable and achievable or not.....so there are a few challenges but I think these challenges are being addressed by *many people right now* but also I believe these challenges could be solved..... so it's just all about coming up with the right technology that fits with the specific purpose

CM: Yeah the application?

■ Yea

CM: Ok, so I think that *kind* of leads or you have kind of answered my next question, which is about your thoughts on what kind of support would be necessary to develop that kind of project.....did you have anything else on that?

■so I think having, er, someone *like yourself*, in terms of your background would be as you say a match made in heaven in terms of having the people who would develop the fibres and develop the technology and you guys who have expertise in textile manufacturing, so having these two together, *working together*, is definitely the way forward, the way to go, so its important also.....because sometimes, we as engineers sometimes lose track of reality in terms of what's really out, like in terms of how is this process really being made, so it's good to have input from people working in this field.....because it will definitely allow us to understand what are the constraints, what could be done in current state of the art machinery and so it's good to have this sort of communication between these two.....er.....different fields, and any other people? I don't *really* know, I mean definitely people who are work on the electronics side..... if the application involves electronics, or people who work in fluidics, *if it involves a bit of microfluidics* and so, I mean definitely, depending on the application you will need specific expertise, but in general..... if we talk about the fibre drawing and the textile, you need at least someone from the textile industry and someone from the fibre drawing industry who is familiar with drawing polymer fibres to work *together side by side* in order to pursue projects that involves both parties.

CM: Ok, definitely, and then I remember you spoke a little bit about the fibre having to be closed through a technique to seal the tip of the fibre, could you talk me through that a bit?

■ Yeah, so basically, we have, in our case we had two wires embedded in the polymer, right, so we needed to create an electrical loop, so if we apply current through one wire it would have to *go and come back* so we need to connect these two wires together, so one way is just to expose these wires and connecting them with some sort of copper tape that is *highly connective* or we apply some sort of silver paint on the tip to get the two wires connected to one another or.....something that is a bit more *sophisticated* is so apply or deposit some gold on the tip just to get this connection..... made.....so it is just connecting these two wires at the tip that is the point of it basically.....

CM: And what is the process to deposit?

■ I mean you can do it manually, the easiest way is to expose the wires and then connect them manually with the copper tape.....or apply the silver paint, just like, you know nail polish.....you just apply the paint

CM: Ok, paint it on

■ Deposition is to has a special machine in the clean lab....or the clean room we have and ■ was the expert in that and applies a deposition, a gold deposition layer *on top of* this polymer, so its one way of going *obviously*, but I think its is a bit much for this specific

application, I think it might be easier to just start with applying some copper tape or some silver paint or something like that, quickly in order to get..... to test the whole system first....

CM: and what kind of tests do you think would need to, it would need to undergo in order to see if it would work?

■ So um, applying basically some current and some power and seeing whether the current flows or not..... um.....obviously if we want to test the temperature of the polymer and how the temperature of the polymer changes we might need to do some tests, by adding some sort of thermo-couples or thermoresistors by adding some sort of temperature measurement...devices on top of the fibre to measure these temperatures in real time or also some people use thermal cameras, just put a thermal camera on top of the fibre and keep track of the temperature so there are different ways of moving forward, or testing.....

CM: Ah ok, then do you think that within this fibre.... if you were to look at this fibre do you think it is evident that there have been, kind of.... that the expertise of different collaborators is within the fibre itself? Would you say that you could evidently see different input if you were to look at it, or could it look like anything else that you have worked on within your lab?

■: I mean there is not really a lot of novelty in what we have done, *for now*, but obviously including other aspects and trying to explore different avenues and applications.... is sort of the way to go and that is really what distinguishes our work from others, er.....I think we are converging towards, or saturating towards the material choices and what we can do but obviously there are people who develop new materials and *come up with new technologies* but this is not our field of expertise, our field of expertise with this drawing technology *is looking for innovative applications* and applications that would really make a lot of use of this fibre drawing technology, so I think more than the material synthesis, and making new materials to make them drawable..... it makes more sense to focus on.....I think all of our expertise is *to focus on the application* and then trying to come up with new applications that are novel and are really makes a lot of use of the drawing technology

CM: Ok, instead of focusing on changes to the material, do you mean?

■: So yeah, I mean there are two ways of making use of this draw tower, some people focus on developing *new material*, or making *new material* in order to make it drawable in order to go towards a specific application, some people go to around and try to come up with their own *new materials* in order to make it drawable in order to develop...

CM: Is that like the work at EPFL?

■: Exactly, I mean EPFL, I don't think they reinvent materials or like *make their own materials* they...would more look around, because they have a better understanding of material properties and things like that.....so in terms of.....they tend make better choices....they choose something, they *try sometimes* and *fail sometimes* and so on and so forth..... but they have a better understanding of materials so they tend to choose materials for specific applications in mind...but

CM: Ok, so they have more material science expertise?

■: Yeah, exactly, yeah compared to ours, yes, with ours we have more of a diverse....er....group of individuals working on this, like physics and mechatronics engineers, so you can say that we are more....on the application side rather than the materials science side.....

CM: Ok

■ And that's why we collaborate with them, because they have a better understanding of this area....and we have a better understanding of clinical applications that might make use of their technologies....which they have problems with sometimes.....

CM: Ok.....I guess the last thing I wanted to ask you about was if you had any thoughts on the broader implications that this type of research could have, so kind of thinking about the ripple effect of using a kind of fibre like this could be?

■: So the negative aspect?

CM: Yes, it could be negative, or whatever you think...

■: Er. I mean one obvious thing is.....aha... using plastics, the use of plastics, I'm just being honest, reusable. I mean we don't consume a lot of plastic.....but we do use plastic.....we draw plastics and obviously plastics is not the most...appreciated part of the whole process.....because heavy use of plastic is not a good thing in general.....so maybe a good way forward is thinking about a group of plastics that are *biodegradable or recyclable* or something like that, so we can have a more sustainable project rather than accumulating a lot of plastic and throwing it away.....But this field is *really tricky*, I mean, it is not straightforward to come up with *biodegradable* and.....you know.....compostable plastics and things like that so yeah.....its, it might be even more expensive to go towards that direction, so people think of *cost*, and say like, oh it will be very expensive to create a polymer to just save a few bucks, or save the environment.....It's like a two sided or two edged weapon, it's not really a straightforward answer.....so.....my concern is the plastic consumption. It is one of the things that needs definitely *some consideration*, it is one of the things we consider ourselves, we try our best to consider, that we reduce the amount of material consumption and drawing.....that we are going to make sure that we make something that has *some sort of potential that it would work* but obviously we run into a lot of failure, especially when you are exploring new avenues, but I think when you get to the right materials properties and the right parameters of drawing and stuff like that.....we don't *really* waste plastic, because this plastic feeds into, feed into.....into... applications, like medical applications.....but medical applications honestly...have a lot of plastics involved in them, all the catheters are plastic, everything almost is made out of plastics, and they are *flexible*, as I said it's not a straightforward answer, but consumption of plastics is sort of my main concern..... but obviously it is the concern of any....any... project that involves polymer processing, or the processing of polymers.

CM: ... OK....can I just as the last thing, share a screen with you and show you some diagrams, you may be familiar with these....sorry I haven't done share screen on Skype before, so I don't know how it will work.....can you see my screen? Ok so if you were to think about, you know if you wanted to further explore this space working on fibres for *clothing* applications, what type of, as expertise were to come together and you were to look at these diagrams, but what do you think might be an *effective way* to produce the best results.....it could also as you were beginning to mention, trying to work on sustainable polymers, or biodegradable polymers..... but yes this is a way of thinking of *different ways* that diverse knowledge sets could come together

■Well I mean, I am more leaning towards interdisciplinary, I feel like this field..... shares overlap with manufacturing, maybe creating something that....a sort of fused equipment and something like that, yeah so interdisciplinary *might be the more*, I mean more like closer to

the model I would think of, er, intra obviously not, this requires a lot of different backgrounds, multi yes, but I feel its disconnected in terms of *you do your part, I do my part* and then we integrate later on, I don't think it's.... the best way to go, to move forward because I think er, during the process, you need the *continuous* integration and continuation and so multi might not be the way to go. Cross, just viewing it from the perspective of others, *I don't think that's possible*, it's very hard to view it from others, I doubt that's going to be..... it's very hard to envisage. So I think interdisciplinary.....yes is the case, because it involves other people.....and at the same time there is a *fusion* that's always there throughout the whole process.....that I think would be *really really* useful in this field of research. Transdisciplinary.....er....I'm not sure if I understand correctly...but....er....

CM: Well, I mean often in transdisciplinary research, it might be that as people come into you know.....working on a specific problem or whatever else, that the work may transcend any of the other disciplines, so it becomes almost its *own discipline* and it often actually has a focus on things that might be..... more social, in terms of say, people working on issues such as climate change..... or.....things that could not be solved by one discipline alone. So, um.... there's also a lot of talk about transdisciplinarity...but whether or not....I guess it is really all these intellectual frameworks coming into one thing, that has transcended these initial disciplines.

█: Well, I mean, as I said, I would be *more leaning* towards interdisciplinary, that makes more sense, transdisciplinary, there's *a chance* of it being transdisciplinary as well.....but..... from my understanding, an interdisciplinary framework would be good.....

CM: Ok, alright, let me just see.....if I can figure out how to stop sharing....well... thats amazing. *Thank you so much*. Thats most of the things I wanted to discuss, if you had any other thoughts about anything we have talked about?

█ So.....what do you need from my end, regarding.....do you need anything else?

CM: Well, if...if....you had, a.....oh.....any information on the type of polymer that you drew.....and....maybe like the size of the the mold that you used, so any specifics around the processing of the material and the fibre drawing and if possible, a picture of the machine, but I was wondering if that was something that youwere unable to share or something? I don't know.

█ Um, I don't think there is a problem sharing the picture..... I just need to take a proper picture then.....

CM: Ohhh you don't have one?

█ I'm going to the lab anyways today so I can take a quick one.....

CM: Oh! Are you! Are you still going in then?

█ I just started this week so.....

CM: Ah wow, you must be happy to get back in.....

█ It's been a while.....

CM: I know, it's kind of ...a lot of things have been disrupted

█: Yes there has been a lot of things going on and I've lost track of a lot of stuff, its crazy.....

CM: Did you have a lot of stuff you could get on with just in the meantime, like writing and stuff?

█: Yeah I've been focusing more on the writing aspect, but was quite, not really.....how do you say?

CM: productive?

█:productive yeah, so its been a bit difficult to get it....

CM: Will you have any extensions on your research?

█: Probably, I'm *trying* to do that, but in the meantime, like I'm just, I have a submission that I need to submit quickly, so I will submit that quickly first and then get focused on the...all of the extension requests. Like a late request form, *they call it a late request form*, rather than a thesis extension, which supervisors don't really likecalling it....as...a..... late, because when you call it late it sounds like you are doing something wrong.....

CM: But I mean I think with the whole covid thing, I think people really understand how disruptive it has been for a lot of people.....because you also have to plan around, if you have a set time, even *replanning* time takes time so...

█: Hopefully they are understanding...the admissions.....

CM: Um...that's really helpful, *thank you* █

█: No problem. Um, I'll try to send you the info you asked for later today, and if I don't send it today, I will probably tomorrow or after tomorrow I will get it done. yeah.....I'll try to take that picture as well.....

CM: OK, yeah, *that would be amazing*. Alright, thank you so much.

█: No problem, bye.....

CM: Bye....