Santa: Broadcasting from the University of British Columbia, this is Blue and Goldcast. I'm Santa Ono, the president and vice-chancellor of UBC. On this season of the Blue and Goldcast, I'm speaking with the people who are leading some of the most innovative and creative work coming out of our campuses. In 2021, UBC's Morris and Helen Belkin Art Gallery partnered with the Stewart Blusson Quantum Matter Institute and the Department of Physics and Astronomy on a project meant to break down barriers.

The result was Ars Scientia, an ongoing UBC research excellence cluster. The cluster paired scientists and artists, challenging them to create work that stepped outside of their respective disciplines and bridge the academic gap between arts and science. Today on the show, I'm speaking to Daniel Korchinski and Josephine Lee. Daniel, a physicist, and Josephine, an artist were paired together to create collaborative research that called on both their areas of expertise.

Daniel, Josephine, welcome to Blue and Goldcast. Thank you so much for being on the show today. I'm really curious to hear your story of your work. To start, how did you two get paired up on this project? What was the process like once you decided to go forward with this initiative?

Daniel Korchinski: On the physics side, I got an email from the Quantum Matter Institute saying, "We're going to have this wonderful Ars Scientia project and we're looking for graduate students, post-docs, professors, anyone who is interested in participating." I think we had about 25 or 30 physicists show up and we were told, "We're going to have this meeting with the artists. All the physicists will give short four-minute talks. The artists will give longer 20-minute talks." It was a bit like speed dating because at the end, you had to rank your preferences on who you want to pair up with. I have to say, I think I was the only theorist to survive which I'm a little bit proud of.

Santa: Josephine, what did you think about this tremendous turnout of physicists?

Josephine Lee: From the outset for artists, there was only four of us. We were, I think, just handpicked and invited for this collaboration sort of out of the blue. The curator for the Belkin, Shelly Rosenblum, she just emailed me, asking me if I was interested in participating in Ars Scientia collaboration with physicists, or at the Quantum Matter Institute and artists.

To be honest, there wasn't much in the way of a direction of like, "This is who you're going to be paired with," or, "This is your expectation or any deliverables" or anything like that. It was more just, what would it be to put two people from very different disciplines together in a single room and see what the conversation arrives at. I think that that flexibility in terms of collaboration between two different disciplines was what I was really interested in. I went in there with very little idea of what will happen and really excited about that prospect.

Santa: It was very new for you Josephine to be surrounded by a physicist? Would you say that physicists and artists are different people, or do you have more in common than meets the eye?

Josephine: I think there's some more in common. I initially imagined that I would encounter a lot of roadblocks in terms of, this is the way that research is conducted, and this is the way that we collect data, and this is how we approach problems in problem-solving. Actually, I was really blown away by their creativity and the flexibility and real desire for play within the sciences. I think that was something that was really surprising and really welcomed.

Santa: How about you, Daniel? How did this project differ from your previous work with physicists?

Daniel: I have to say, so I've done a bit of interdisciplinary work before with neuroscientists, and it was actually, it was really tough. We re we talk past each other a lot. I feel like with Josephine, we've formed those initial language bridges really quickly. It didn't feel like we were talking past each other at all really. I have to say, it was surprising. I expected it to take a lot longer before we got to anything almost productive, but it felt very natural. I think we have a lot in common when it comes to our practice when it comes to research and the questions we want to ask.

Santa: What was the biggest challenge to not only the two of you, but to the other physicists and artists in the room to this whole process, which I think-- I'm a big fan of what you did by the way. What would you say was the biggest challenge?

Daniel: I think initially, there's a bit of inertia. Especially with COVID, it's so easy to get locked into a cycle of, "Oh, we'll meet every week or two on Zoom and have a nice conversation and think about these things abstractly or theoretically." I think it really starts to make a lot of progress when we actually dedicated time in the studio and started having experiments with glass as a media and working with this professional glassblower. It was overcoming that initial barrier. Once things started rolling there, we had so much fun and so much productivity, I would say. That was the hardest barrier initially for me.

Santa: How about you Josephine?

Josephine: Yes, absolutely. I think because it was-- the residency was at a six months stretch and a lot of it was online because of the pandemic, it really tempered and slowed things down in the sense that the momentum that we were trying to gather was quite difficult. Initially, it was really just us trying to spend that time getting to know each other and who we are. We took long walks. We chatted a lot. We talked about our mutual interest in the mountains, and climbing, and hiking, and backpacking.

Then eventually, we found ourselves in the face of a deadline which was the symposium. I think that motivated us also to find an overlapping mutual interest which was glass. That material fascination for both of us propelled us into an opportunity to work with a glassblower at the Granville Island, Vancouver Studio Glass Center. That really catalyzed our research process. Really, I would love to echo Daniel's comment that most of the work really just starts happening when you get into the studio or the lab or wherever you're starting to work.

Santa: Tell me exactly what did you do with this glassblower at Granville Island? I just want to understand, that it was a galvanizing moment. You had this deadline, you had a symposium around the corner, what did you do in Granville Island?

Josephine: We approached the glassblower there who has just an incredible wealth of information. Shout out to Benjamin Kikkert who helped us along the way. We really just came in there wondering how we can push the limits of this material. Then Daniel had some great ideas on how we can start that process of what pushing the material actually meant. Once we got to that point, we started to really move into focusing on a specific ideology of glass, which was the concept of lenses.

We started building lenses out of glass and creating prototypes that will eventually later be demonstrated in the symposium. Daniel, you could probably speak better to the Prince Rupert's drops that we did and then the high-speed camera stuff, and all the crackling and everything.

Daniel: Yes. As Josephine said, we did some optics work, making lenses. There was a mutual interest I'd say in optical illusions, so developing lens works and glassworks that'll do things like obscure objects instead of magnifying and things like that. One of the other avenues we wanted to travel down was looking at something called Prince Rupert's drops. They're these wonderful things where you take a molten glass and you drop it in water. Actually, I bought a fish tank from this strange guy on Craigslist who had a big pickup truck full of fish tanks and got some lovely high-speed camera footage of basically making these Prince Rupert's drops.

They are a strange material because the head of these things is tempered, they're tempered, they're essentially bulletproof, and yet the tail is very fragile. If the tail breaks, the whole thing explodes quite violently. It's a wonderful juxtaposition between strength and fragility. We were lucky enough to find some colleagues at the Spinal Cord Centre who had this incredible recording set up for something like 120,000 frames per second cameras. Where you could actually watch the shockwave pass through this Prince Rupert's drops, and you could actually see it traveling six times the speed of sound or whatever it is, and then having the bulb actually shatter.

That was a really wonderful experience. Collaborating with some experimentalists outside of either our fields and pulling in more expertise.

Santa: That's pretty cool. I don't quite understand. You met this strange person on Craigslist with lots of aquariums. Can you tell us what is actually, this, did you say Prince Rupert's? Can you explain it a little bit more for someone who's not in the know?

Daniel: Typically, when you're working with glass, you take a molten glass out of the furnace and you might work it on a metal rod or something like that, pulling it with pliers or blowing it with a glass blowing pipe. Here we did something a little unusual. We took essentially a ladle of molten glass and just up ended the ladle into a fish tank full of water, and you get this tremendous plume of steam and crackling sound and boiling water and the glass very quickly cools. In fact, it cools so quickly.

Santa: It doesn't crack? It doesn't shatter. It doesn't shatter?

Daniel: Yes.

Santa: That's amazing.

Daniel: That's a big surprise actually. It's really unusual. If you just leave molten glass in open air, it'll shatter because it's not being cooled down gently. Normally after you've made a glass molten piece, you put it in an oven and very, very, very slowly bring the temperature down so that it doesn't crack with the cold air. Here you accelerate that process by a factor of 1,000 or 10,000 and yet somehow it actually makes a super strong, robust droplet. It's a weird paradox.

Santa: Can you control, for example, the width of different parts of the droplet, is a droplet always the same shape, or is it something that you can affect the shape of the droplet?

Daniel: That's an excellent question. We did experiments a little bit with how the total amount of glass affected things. We tried making progressively larger and larger droplets, and we found that there seemed to be an upper limit, if you went too large, the thing would shatter in the water. There's something where it seems like if the center is still molten while the outside is cooled, you're going to compromise the integrity of the thing.

Santa: I thought when you were talking about making lenses and parts of the lens that would obscure something, an image, and other parts that would magnify. I had this impression that when I go to Granville Island, I see some glass that is on a rod and you turn it around and you can actually use things to actually deform it in a controlled way. When you're actually taking molten glass and rapidly cooling it in water, you actually really can't control where you obscure or where you magnify through the lens. Is that correct? It's accidental.

Daniel: Yes. There is a wonderful stochasticity to it. I will say we didn't use the Prince Rupert's drop for lenses too often, or really, we did one optical experiment with them. Because there's a wonderful tool called a polar imagery set-up, you can build, where you can shine polarized light through and see where the stresses have built up in the thing. You get these beautiful oil slick iridescent patterns throughout these Prince Rupert's drops, because they have these incredible amounts of stress that they're under. That's why they explode violently when they do crack.

Santa: Could you do something like this? Could you introduce dyes into the molten glass that since you're super cooling it in the water, that it wouldn't diffuse in the molten glass. That if you do use them as lenses, that you could obscure parts of the droplet, but not others. Is that something that you can do. That's the artist question Josephine, would that be something that would be of interest to you?

Josephine: I think that for the Rupert's drops just in terms of our own experiments, it was like trying to see what those boundaries are for the material. Then for coloring, the way that you color glass is you use a powdered glass and so it's called frit. You essentially just wrap layers of glass on top of other glass to create that coloring effect. I'm not quite sure how that would work in terms of like a Prince Rupert's drop, because then you would take the molten glass, you would've to press it onto powdered color glass and then drop it into the aquarium or water.

I would imagine that some parts of it would probably attach and adhere, but color was less an evident factor for myself personally, in my own research. What I wanted to see was questions about how optical lenses in general were constructed throughout time to magnify and to focus and to clarify vision. We have eyeglasses, we have microscopes, we have telescopes and all of these sorts of screens that mediate our vision in some way or another. Then with that visibility comes questions of hyper visibility, and what control or censorship or violence emerges from hyper visibility, especially for BIPOC bodies. My artistic practice was trying to refuse to be seen in some ways.

What would it be to create optical lenses that instead of doing what they were actually meant to do, would be doing the opposite? How can you actually create a lens that for all intents and purposes looks absolutely clear, but by the shaping of it, or by the configuration of it would allow the subject to disappear, it would erase them or try to hide them. You would create obscurity or opacity, or just simply erasure or redaction in some way to give the hyper-visible the less visible, and to shield them or protect them in that way.

Lenses in that way, I really wanted to gravitate something that was already clear rather than colored, but I think colored in terms of like a next iterative practice would be incredibly interesting. It's just like a whole another realm of glass science that's involved. I don't think we got that far within the times span we have, but yes.

Santa: Josephine, I really am intrigued by what you just said about issues of social justice and obscuring things that might be problematic or controversial, things like that. In the university we wrestle with that all the time, and it's actually imbedded within the BC human rights code. The general issue, is, what kinds of things should be heard or seen on a university campus.

You have in that code part of it where, the foundation is that all sorts of views and ideas and individuals should be seen and heard. Because the diversity of thoughts, really the thinking is, will provoke the dialogue and reputation of things that might be problematic that ultimately leads to a stronger conviction of what is right versus what is wrong. Then there's the other side of the BC human rights code that has to do with the fact that some sorts of speech or some sorts of actions can actually be harmful to individuals, especially to BIPOC individuals.

I'd love to, since you've been thinking about-- this is a fascinating project you've been working on. I'd love to have both of your views on what you just said, Josephine, obscuring things. When is it right to do that? When is it actually counterproductive to do so with respect to what we ought to be doing in the university?

Josephine: Sure. I think it's an incredibly complicated question, which is why I really love it and I love studying it and thinking about it. because there's no real concrete answer. You can speak to the history of the polaroid camera and the company where they created, what was essentially these polaroid cameras that were portable police identification devices. They brought these to South Africa during the apartheid and then they distributed them to the police officers. Then they would take about 100 or

so photos in a single hour of Black citizens. They would push this button called the boost button, which would increase the flash within that camera by 42%.

Essentially exposing the citizens to this polaroid device, which would then allow them to create this very controversial pass book, which allowed, or didn't allow or restricted citizen movement within the country. You have here a very concrete instance in which exposure and visibility created control and power and censorship, and essentially reproduced this violence that was happening within the country. On the opposite side, you have questions of visibility when it comes to, as you said, like the people who are just made invisible and not actually given a right to be seen or a right to be heard.

There are numerous cases, even within from -- Spanning from nuclear age of photography and documentation, and how our very view of the atomic bomb was didactic and, in a way, curated. Because the images that we were seeing were the images that we were fed by the military, and most of them were just the mushroom cloud at a distance. You have this like spectacle, spectatorship, performative action of the nuclear. Which actually doesn't demonstrate that this sheer visceral, terrible destruction that the nuclear bomb actually held within that time, and decades after.

I think essentially it's really questioning, first of all, how do we want to be seen? Then who is allowing that seeing, and that visibility to happen. Who is controlling that those apparatus in those technological devices in the first place. If we can really critically examine the material and the apparatus and technologies that govern with visibility or invisibility, I think that that will help us determine the right path to go forward.

Santa: It's fascinating. I get a sense that you value this interdisciplinary exercise. What has the impact been on each of you in going through this exercise?

Daniel: Well, I think for one, going into this, I was a theoretical physicist. I do a lot of work on computers, writing code, or pushing equations around on a pen and paper. I think this experience is really wonderful because it let me get my hands dirty and get my hands actually on the materials that I'm so often studying theoretically. I've been studying glass in my Ph.D. for two years now, and it was only just recently that I actually saw the stuff being made and actually understood some of the practical applications of it. Actually got to hold, some of the pieces of glass that I've made. It's so wonderful to actually have some tangible weight associated with the things that I've made.

I feel I'm a much more complete physicist. There's a lot of experimental skills where you're overcoming problems and rapidly iterating on things. As a theorist I don't get to practice, and I'm a lot more confident now. Perhaps when I start my own lab in a decade or half a decade or something, there can be an experimental component to that lab, or I'll be a lot more confident working with experimentalists and knowing what it is in the lab that's going on. Now it's led, as I mentioned earlier to collaborations in the Quantum Matter Institute with some of our new professors there. Dr. Alana Hollis is helping me with some crackly noise that we're investigating, that's a follow up to some of the work we did at Benjamin's glass blowing studio. Really I just feel it's really filled me in and made me a much more complete physicist.

Santa: Josephine, tell me a little bit about the impact of this whole project on you and how you approach your work.

Josephine: I think it's had an enormous impact, because as I was doing it, I just entered the Simon Fraser University's first-ever inaugural Ph.D. in art practice program, and so I'm doing a practice based research, a doctorate now. This residency came about just as I was starting it, and so it's really jump started and pushed and directed my research in a completely new and different way that I never thought would actually happen. I'm really excited about continuing these experiments with glass and continuing to work with the studio and trying to find different optical lens practices.

Santa: I'm really excited about this Art Scientia UBC Research Excellence cluster, and just thrilled to hear from both of you and the impact of this on your lives. I've got a question for you. We have a situation here at UBC where we have separate faculties of arts and science. As you know, at many institutions, there's one faculty of arts and sciences. You hear the debate and it goes back and forth. There are even institutions that go back and forth between having a faculty of arts and sciences, and then they split to have separate ones, and then they get lonely and they want to come back together again.

I'd love to hear from both of you, is there a right organizational structure. Taking into account what you've experienced and what you've said was the impact of this on you. Does it make sense for us to have either combined or separate faculties of arts and science. What's your view?

Daniel: That's a really interesting question. I feel in some ways, what you need is bottom-up organizing. You want to have artists, and scientists spontaneously organizing and bring themselves together. Obviously, an organizational change that could help foster that could help encourage these collaborations. I think at the end of the day after this project, I feel like there's too much siloing, there's no need for these artificial divisions between fields.

I'd love to see some process by which it would be easier for people to get a sample or see what's going on in other labs and other departments and other faculties. I don't know if merging arts and sciences will be the deal, or if that's the solution to the problem, but it might help certainly, though I can think of other initiatives that would maybe also accomplish that.

Josephine: I don't think it has to even end with arts and science, why not arts and business, or law and science? I feel I'm all for the radical change that we want to see in the world. If people want to specialize and they want to have that specialization within their majors, that's great. I think one of the things that I found challenging when I was at UBC doing my undergrad, was I found it very difficult, even just to take a class outside my department, and even get that process alone, that difficulty makes it restrictive. If we can just cross the board, take any class you want, learn anything you want, try anything you want.

Than then cross-pollination will happen naturally through the course of people interacting with each other. If those barriers exist within that registration process

itself, then it's going to be very hard for students to even know that it's worth taking that effort in. I think that the way to do it is just really make it as open as possible.

Santa: Certainly, there's been argument for continuing this investment through research clusters. I'm just so thrilled to have you on the Blue and Goldcast, Daniel and Josephine. Thanks much for being on the Blue and Goldcast podcast today. Daniel Korchinski is a physicist. Josephine Lee is an artist. Both are part of the Arts Scientia, UBC Research Excellence cluster. Thanks again.

Daniel: Thank you for having us.

Josephine: Thank you so much.

Santa: That does it for this episode. You can find links to our guest work, as well as previous editions of the show at blueandgoldcast.com. You can also find us on your favorite podcast app, like Apple Podcasts, SoundCloud, or Stitcher. You can tweet me @UBCprez that's prez with a Z. I'm Santa Ono. Thank you so much for listening.