

Grow Everything Interview Transcript: Beth Tuck

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Guest: Beth Tuck

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KARL: Hey Erum.

ERUM: Hey Karl. What's up? Happy New Year.

KARL: Happy New Year.

ERUM: Hey everyone, you might hear that I'm a bit nasally. I'm sure a lot of you have been feeling a little under the weather, so sorry if I sound a bit discordant. I know I heard this episode.

KARL: Yeah, I heard that. I sounded very sick during the Axel interview, so I was also sick, but I'm better now and hopefully, I didn't pass it to you.

ERUM: Yeah, I think it's just like the whole world is just a bit sick. In different ways.

KARL: Yeah. So the whole world is sick. And speaking of the whole world, as we record this, the biotech industry is meeting in San Francisco to celebrate because I call it a celebration, the JP Morgan healthcare conference, which happens annually. And this is the first time the conference has been held since the pandemic. They held parts of it virtually in 2021 and 22. So I think this is the first time that everybody is converging in San Francisco and we have a lot of friends and a lot of customers, clients who are all in San Francisco, and the level of deal-making is just astounding.

ERUM: JP Morgan is like the CES for our industry, except that JP Morgan really focused on biopharma, not necessarily the biotech or synbio that we've been talking about throughout these podcasts, but we will be getting into biopharma.

But yeah, I was looking at some of these deals. We had, you know, 440 million dollars [BioNTech](#) buying an AI company. These deals are in the hundreds of millions and billions of dollars. Of course, it's pharmaceuticals. So a lot's going on, but it's a small group of people, so we really wanna make sure that people that are listening, we really wanna get other people knowledgeable on what's going on in biotech so they can get a little piece of the pie.

KARL: I think it's very related to this podcast, which we'll get into in a second. But I just wanted to mention a lot of companies, and we see this because of our business, announce deals late in December and early January. And, we had a client who announced a hundred million dollar funding.

Our friends at Azimov announced a nearly 200 million dollar funding; that is much more of a synbio deal, but it also touches therapeutics, it's particularly, gene and cell therapy, manufacturing and making it more efficient, and then big pharma tends to announce multi-billion dollar deals during this conference.

But a statistic that I just heard that I've been sharing is that I don't know what year, but let's just say 2020, or 2021. The entire biopharmaceutical industry produced 300 billion in revenue around biologics. So that's any medicine that is produced, using a biologic, so that could be an antibody, it could be a large protein. 300 billion is bigger than the GDP of many countries. But from a volume point of view, if it's more than, a hundred, liters or a thousand liters of volume it's a very small amount.

And then on top of that, the number of people that are producing that value is very small. So this is an industry where very few people produce outsized results and are producing incredible amounts of value. And so I think that that's probably a good segue into this interview that we're having with Beth Tuck of Genspace.

ERUM: Yeah, Beth really brings biology to the people, Beth and Genspace and her whole team. She's doing it in a way that's accessible and friendly. It's not very academic, but very fun, and you'll hear the types of programs that she runs. I'm really excited to see what they're doing.

We are going to their lab tomorrow. I had gone to their first lab, which was a little bit grungy. I hope that's not offensive. I think it's kind of cool. It's really industrial, in Brooklyn. I mean, hello.

But this new space supposedly has newer equipment, bigger. So I can't wait to see that. but I'm really excited to talk to Beth. I really want the people, you, the audience, to hear what she's doing. She's a great science communicator, so you guys are in for a treat for sure.

KARL: We've said it before, this is part of the Grow Everything Mythology. Erum and I met there at Genspace many years ago at a computational biology meetup. We also met [Cas Smith](#) there. We met [Ellen Jorgensen](#) there. We were part of a lobbying group that was lobbying the City of New York for more non-healthcare biotech a few years ago, and we ended up meeting [Shara of C 16Biosciences](#) there.

There are a lot of people that we've met through Genspace. It's been an enormous connector, and we know a lot of companies that have come out of there, most notably [Curie Co](#) and [OpenTrons](#) and OpenTrons is a billion-dollar valuation company that probably employs 200 people in the New York City area.

So Genspace is a catalyst, it's an educational place and it brings a lot of people together and I feel like we're very lucky to have it be part of our community and to be a part of that community. So I think with that said, let's talk to Beth.

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ERUM: Let's do it.

Transition

KARL: Welcome Beth. It's great to see you today.

BETH: Great to be here. Thank you so much for having me.

KARL: Why don't we start by talking about what is Genspace? Let's start there and then we can get into how you got there and what's interesting about it.

BETH: To put it simply, it's a community science lab where an open access science space that kind of operates like a hybrid between a WeWork, a makerspace, and a library. We have a little bit of a pre-incubator vibe. We have a hands-on science education flavor to what we do. We're also a crash course in grad school. So all of these different flavors come together in this one little community hub where we create opportunities for people to learn, create, and grow together.

KARL: You also throw parties and events!

BETH: Yes, that's right. We love socializing. We love bringing people together for fun things. Absolutely.

ERUM: Speaking of bringing people together, you actually brought Karl and I together.

Genspace is where we met. We went to a computational biology meetup of all things. I think we're both curious minds and have that biology background, so we do owe Genspace a lot of gratitude for that.

KARL: Yeah, absolutely.

BETH: Those are exactly the kind of stories that we love hearing because that's what we know intuitively we do.

KARL: That's great. Yeah, so it's definitely a community builder, but I was wondering if you could talk a little bit about what the community outreach looks like at Genspace.

BETH: Maybe I can start by framing just like the overall programming buckets of Genspace, and then dive into the youth and community outreach side.

So Genspace's, programming buckets are fourfold. We have a membership program where people can come and use the lab as their lab, as their design studio, as their

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research center, and as their creative practice-making space. It is a place where people can innovate with a low barrier to entry.

The other thing that we do, as you all mentioned earlier, is our classes and workshops. So we have events and programming where people could come and learn a new skill. They learn from experts in the field. Often people that they would never have access to otherwise, and they get a chance to actually practice doing these technical skills that are usually reserved for academic labs and industry settings.

And then the other buckets of programming that we do, as you mentioned, are our youth and our outreach and other bits and bobs. So we have, now with our sixth year running our BioRocket Research Internship program, which is a youth focused, youth centered, research experience in synthetic biology and biodesign.

We take 12 to 15 high school students each year. They get a six month crash course in science and then, in the summer, they're doing a really intensive research program that they actually design, and then we as staff enable, which is pretty unique. Most of the time you get plopped in aloud and you do the project that your mentor has set up for you.

And then in this case, we're really co-creating research with the students. And those are students from title one schools. So generally low resource schools. 90% of the students are from an underrepresented demographic group in STEM. It's our responsibility to make sure that we're trying to level the playing field and create opportunities for youth who don't normally get that opportunity.

So that's one of the ways in which we're engaged with our community. And then the other is course through like public programming in the neighborhood. So just last weekend for example, we were out from 11 to 6 at the Sunset Park Street Festival doing strawberry DNA with over 500 families.

It came through and we were teaching them a little bit about science through a really fun hands-on way and watching that magic of discovery when they pull up the DNA threads and they're seeing it for the first time. They're like, oh, normally I just eat this. So to kinda see that there's something deeper to what they see.

KARL: That's so fun. And for people who don't know the Sunset Park neighborhood of Brooklyn, how would you describe it?

BETH: So Sunset Park is an extremely diverse community. It is heavily working class, it's heavily immigrant. It's got a very large proportion of Latino and Asian American community members.

And so it's linguistically diverse. It's a beautiful neighborhood. It's a lot of kids and families and they're looking for opportunities for their kids to get excited and inspired by science. And so we try to provide opportunities for that.

KARL: So how did you end up at Genspace? What was your journey to get there?

BETH: Yeah, I've had a meandering journey through my science career. I love science. I did my graduate work at WashU in St. Louis, and I was studying inherited neurological disorders and spending time at the microscope and making mouse models and doing all these things. But what I always felt was pulling at me was how do we get more people engaged? How do we excite more people about science? And again, how do we level the playing field?

So I grew up in Appalachia. There were not a lot of opportunities for really rigorous science education or science experiences for me. And so that's always been a flavor of the work that I do is about making sure that we have equitable access for science education. And so from there I started working in informal science education and I taught at a few places.

And in all those spaces too, what I was noticing is like, there was a limit, you could only teach so many things until you got to the point where people were really ready to do their own thing. They wanted to explore their own questions, they wanted to take their research further.

And in science education settings, that's not what they do. And so when I learned about Genspace and it was this lab, this little playground where people could make things and innovate things and explore their own questions, I was like, that's the thing that we're missing! That's what we need.

And it's that kind of third space. It's not academic. It's not with the same kind of pressures that academics face. Third spaces can cultivate a different kind of creativity and imagination and innovation that isn't incentivized in traditional academic structures.

And again, it can take the education that step further where people actually really get to chase their own curiosities. And that's what I fell in love with about Genspace was just the platform-ness, the place where you can make things.

KARL: You said you grew up in Appalachia and then you were at Washington University in St. Louis. What was the trajectory to get to New York City or to Brooklyn? To Genspace?

BETH: Yeah, that's where the meandering part came about. So I worked in a science center. I adjuncted, I worked at a biotech startup. I taught in a high school. I landed at the NIH where I did a fellowship with them and the Smithsonian and the American Society of Human Genetics. And so with all of those, the unifying thread was: we need more people to be participating in this emerging bioeconomy. We need more ideas. We need more diverse ideas. We need solutions that will meet the needs of more people, especially people who are not represented in these emerging fields. And where can we

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do that? The traditional structures at play just don't incentivize those things. So when I was in DC I was working on setting up a community lab, like Genspace there.

And I have some really amazing collaborators there in the DC area who are still holding it down. But I was like lugging equipment around in the trunk of my car. We were setting up in a makerspace at a festival, a fair and doing PCR on the subway, whatever we could do.

And starting to get involved in community science. And that's where I met Dan and Ellen and some of the original Genspace folks who eventually brought me up to be the education director. And then I transitioned to being the executive director about two years ago.

KARL: Yeah, it's interesting because the Biden administration had that executive order and on Twitter, [Arye Lipman](#), a friend of ours who's a VC was asking, how would you spend the 2 billion dollars? So it's been interesting to see how people are answering it.

But there was someone who did post, some of this money should be for more educational efforts. But I think Arye, in response to the community comment said, that's actually a really inexpensive one, and those should be widespread.

BETH: Compared to universities, compared to institutions we're really cheap. We're really thrifty, we're really good at doing things that are efficient. And it, I think it would be a really wise investment to support community labs.

KARL: Yeah. And so along this journey that you've taken, from getting your doctorate and working in these community labs and doing all this educational work, what's been your big lesson that you've taken on this journey?

BETH: Yeah.

I think for me the lesson definitely comes down to the reality that talent is everywhere, but opportunities are not. And so really thinking through the need for spaces to cultivate that talent, right? There are innovative ideas in everything from fashion design to cosmetics to new potential therapeutics to public health. The ideas are out there, but they don't always have space, resources, access to other collaborators, access to equipment, like those kinds of pieces that become barriers for people to actually take that innovative idea to the next level.

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And so that's fundamentally what we wanna be doing at Genspace.

KARL: Give us a sense in terms of what the space looks like. I remember when it used to be on Flatfish Avenue, Half the floor was like this weird makerspace, and the back of it was this cobbled together lab. How is this space, describe the building that you guys are in, in Sunset Park and what's in there? What's available? What are the resources?

BETH: Yeah, it's a funky little space still. People have been telling us it's a little bit more polished than the old space, but it's about 1300 square feet. We have all sorts of gadgets and gizmos that people can use.

We have about nine benches that people can use for their own research. We have, minus-80, we have a sterile hood, we have a shaker, we have all the incubators you could imagine. So we have the standard set up here, but we are also actively growing things like plants, algae, kombucha, all sorts of different types of microbes all in one place, which is a very different thing for me coming in as a very traditionally trained science person. So that was a treat to get to see all the variety.

And then because of that, like variety of things that we grow, we often have people innovating their own, like open source hardware and software. So they're creating devices and things that can, either support the growth of their favorite critter or make it easier for them to do their work from remote or other sorts of technology innovations. It's a cool space. I love it.

KARL: And the thing about Genspace, I think that probably also people don't know is that several companies have, either come together or been incubated there and have moved on to big success. Could you describe those?

BETH: Yeah, so we've had at least 13 companies and entrepreneurs coming through Genspace since 2017, so averaging around three per year. So it's not a huge number, but it is a big impact in terms of, those companies would never have been able to get off the ground if they hadn't come through our space because they had the access to the easy-to-get-into technology space where they can build out their IP before they grew into being ready for their angel investors or their initial seeds or whatever it was.

So we have four major areas where innovators work. It's in that low-cost automated lab equipment. We've had some biopharma diagnostics and therapeutics companies. We've had a couple that have worked in environmental remediation, wanting to engineer microbes that can degrade environmental contaminants. And then we've had a few that have been working in consumer products, fashion, personal care, and a CBD company as well.

ERUM: Can you go into a little bit about those companies, like the personal care space and materials and CBD? I don't think that's talked about often in biotech, but I think it'll be good for our listeners to hear.

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BETH: Yeah. So, as an example, one of the companies that has had intersections with Genspace at one time or another is [Curie Co.](#)

This is [Erika Milczek](#)'s company, and [Will Shindell](#) who used to be Genspace's lab manager, and I think again, like you'll have to fact check me here, but I think what they're doing is doing enzyme engineering to be able to make replacements for what would typically be petrochemical based preservatives and other bits and pieces that go into consumer products.

Everything from band-aids to laundry detergents to household cleaners, other sorts of materials. Anywhere where there's a need for an enzyme that could replace a petrochemical.

KARL: Yeah, I agree. And I think the other, thing I think of when I think of Curie Co is, being able to order much smaller quantities of those enzymes because if you have to go to a big, like a Novozymes or a DSM, you're only gonna get an order in of, several thousands, several tens of thousands of liters. You're never gonna be able to get like that bespoke enzyme. And I'll say this, and this might not even be true, I'm not sure that they're necessarily focused on the sustainability angle the way that Curie Co is.

BETH: That's right. Absolutely.

KARL: What about some of the other companies? If you can reveal those.

BETH: [Werewool](#) has also called us home over the years. so Werewool, maybe you all know this already, is a, synthetic biology materials company. They're working on making performance fibers from natural sources, so they're working on protein engineering for performance fibers. And they came to us initially as an outgrowth of the biodesign challenge, which also was an outgrowth of Genspace.

And then they were working with us as part of the FIT Scholars program, and they learned a lot about biomimicry and how we can communicate about the science and the nature of what we do. They worked at Genspace for part of that time to build out their IP.

Then when the pandemic happened, they lost access to their academic research lab, their collaborators. They weren't allowed to go on campus at that point. And so they were like, what do we do now? And so they came back to Genspace to be able to have a home where they could actually do about six, nine months worth of experiments that were pretty crucial for them to land a couple of extra prizes that set them up to be able to grow their business now.

KARL: I think it's amazing because you mentioned OpenTrons is now basically like a billion dollar company, employs, I'll just say, a hundred, maybe 200 people in New York City. you're talking about Curie Co. Which, has also, left, or let's just say graduated Genspace and has been hiring people. I don't know what stage Werewool

is at. But all of those companies, having access to this community lab have been able to go out and make an economic impact which I find to be amazing. And so I think that brings up the question in terms of what do you think the advantages are of having Genspace located in a big city like New York City, but maybe specifically like in Brooklyn?

BETH: Yeah, I think to me the sheer volume of people in a big urban setting, like New York, especially New York, with its angle in fashion and consumer products and some of these things where it has such a long history of innovation and industry, being at the forefront of industry practices.

I think being in a place like New York for an organization like Genspace is just like such a natural fit. That between the scientific capital, the creative capital, and just the interest level and being able to bring together experts from all these different fields, like it's that, it's the convergence thing that really makes Genspace what it is, what makes New York what it is, it's the ability to meet people here, to bring together these really innovative ideas.

Because, if you have a fairly homogeneous group of humans that are trying to develop a solution together, you don't get the kind of really wild things that set the field forward in a provocative way. And that's what, a space like Genspace can do, which is almost a culture clash of like designers, artists, scientists, engineers like working together on a shared problem.

ERUM: What are some of the wild things you're seeing today? Like maybe, these are some of your community members that are not entrepreneurs, they're just real experimenting in the lab.

BETH: Yeah. One of my favorite projects that people are working on right now is one of our community projects. So this is, again, a group of people that are working together as members in the lab and they're working on engineering spider silk as a replacement for collagen and other protein-based materials in consumer products. So eventually they might work on actually spinning the spider silk into fibers. But for now they're just working on short peptides.

But the idea is that again, like they've got, a self-taught biochemist who comes from a tech and software background, they've got a sustainability expert, they've got an architect, a couple of other material science people. They've got me, who has my molecular biology background. And so we're all imagining and like right now they're actively in the process of designing their first synthetic sequences that they're gonna send out to Twist and have 'em synthesize and start to express in the lab.

ADD Twist Definition

So Beth mentioned Twist and Twist Biosciences is a DNA synthesis company that actually does a lot more than synthesize DNA. But what that means is that if you're a

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scientist or a researcher that needs DNA that you're gonna put into your organism or you wanna work with. You basically can go to the Twist Biosciences site and put in information on the sequence that you want.

You order it from them. And then in a few days or a few weeks, depending on the complexity or the length of that sequence, Twist will send it to you.

Outro Definition

BETH: So we're like just getting started with the project. But it's been a really fun collaboration, bringing people together from a lot of different backgrounds to innovate together around this shared question.

KARL: Amazing. I think that really speaks to this idea of convergence, different audiences and maybe you could talk a little about the people that come through Genspace. Because I took a CRISPR class, I taught a class, and I seem to remember that the variety of people was just so great. There were a lot of programmers, there were just a lot of science-curious people. So I thought that like from a community building and just being exposed to a lot of these people was really, very stimulating from an intellectual point of view. But maybe you could talk about the people that you see come.

BETH: Yeah. So your intuition of that was exactly right.

90% of our people who come through are not biologists. So they are coming from all of these other backgrounds, art, design, computer engineering, hardware engineering, electrical engineering, all of the engineering fields, certainly. And then the other kind of bucket of the creative arts and design practices. We also get retirees and we get homeschool families and we get middle school teachers, and everyone in between. And again, it's that convergence of people like, many times you'll notice that the hardware engineers are really impressed by that question that curious eighth grader just asked.

Or you'll see the flip side where the curious eighth grader will notice a new career path that they hadn't considered before, and they start asking questions in those downtimes. So it's extremely diverse in terms of who comes, who's curious and what I think is really special about it too is that it's a fairly level playing field.

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You have a 30 year veteran software engineer sitting next to an eighth grader in the same class. And that's not a learning environment that you see very much in other spaces.

KARL: I seem to remember that there was, maybe this was at Flatbush. I don't know if it's the same is, where you are in Sunset Park, but it seemed I would say a third to half of the people that were coming through were either designers or artists. It seems like there was a very, I'm not gonna say over-representation, but it felt that way. Do you still see that?

BETH: Yep. It's about 40%. So your, again, your intuition was absolutely right. Yeah.

KARL: Amazing. Yeah. So Kristen, my wife, is a painter-art teacher, and I think she's taken like a lichen or some kind of microbial painting class. And, then our friend, Karen Ingram, who's an artist also teaches there. So I think it's amazing to see how the artists takes to these new media. And then, Dan, who was one of the original founders, Dan Gresham, went on to start the Biodesign Challenge, which was just all about teaching designers how to use these new technologies to change design.

And they're also seeing companies spin out of that effort. So I think being able to bring these diverse audiences turns out to be an economic driver that probably most people don't even consider.

BETH: Absolutely. And what you'll find is that fashion designer teams up with that material scientist and suddenly we've got a new product line. Because they met each other at our lab.

KARL: Yeah. I'm curious about what kind of feedback you get from people that come through, like the members, the people who take classes. I know Erum and I are huge champions for Genspace. We're always telling people about it, but what do you hear people say?

BETH: Yeah. The overarching message here is that Genspace is lowering the barrier to entry. Like the stuff is just really hard to get your hands on unless you have a space where you can do it, unless you have mentorship, unless you have collaborators, unless you have an easy learning experience. It really is fundamentally about lowering the barriers.

And so for our youth, they come out of our programs equipped and ready for their next classes we hear over and over again that when they go into their AP bio class, after they've been in our internship, they're like head of the game and they're teaching their peers how to pipette and how to load a gel and how to do all these things. Getting their internships their first year in college, because again, they're, they already have this like really fundamental critical skill set that PIs are looking for. And that, again, sets them up for success, for their futures.

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For our adult learners, oftentimes you're hearing these stories about them incorporating new, scientific media into their practices. They build their network, they meet people who can potentially become collaborators or partners in their artistic work.

And then for our members, again, there is as you mentioned earlier, this social aspect. People meet each other. They add their own knowledge and expertise to other people's projects. It's in those informal, serendipitous moments that real magic happens and people appreciate being part of a community like this where they really get a chance to banter back and forth, to engage with each other on interesting science and innovation topics.

ERUM: So I know you're doing a lot in this space of promoting bioliteracy, but where do you see the future of this bio education?

BETH: Yes, I really do believe that we have got to get ourselves out of the traditional route of education, which is like, pound them with information and expect them to regurgitate it on a test.

We have to embrace the fact that science is hands-on practice, and we really need to push our policy makers and our educators to be able to engage in hands-on science. That really is the future. And I do believe that more and more science education and biology education especially, is gonna convert to project-based, around issues that are relevant to local communities, especially around these really big global issues like climate change and sustainability and access to healthcare and medicine and all of these other big problems, messy problems, and the ways in which we can empower young people, especially, but also, adult learners and other folks who are gonna be coming through and innovating in these cases to think about local solutions and distributed networks for innovation.

KARL: Yeah, I'm just gonna interject a comment before you ask the next, because the Biden executive order and then Arye's question on Twitter, it was interesting cause there have been a number of people who said, we should have labs or national labs that are set up locally. And I think of the six or eight ways that you can slice the US economy regionally and think about what it would mean to have a regional lab that's focused on the Northwest or the Midwest and how if that lab was just specifically focused on local issues, what that would look like.

And I think it's a very interesting, newer way to look at, not just creating economic opportunities, but solving problems that are much more local and getting people much more involved.

ERUM: And I would say in order to get people more involved, they have to learn more about biology and there's a big problem of bio-illiteracy, so do you have any thoughts on how to address bio literacy?

BETH: Yeah, in my view, we have to unpack a little bit about what we mean by illiteracy and really try to understand, like what is it that motivates people? What is it that makes them wonder? What is it that makes them curious? What is it that makes them skeptical? And if you can understand what those issues are, then you can address the illiteracy a little bit more intentionally. Because if they're coming in, not necessarily with an antagonism towards GMOs, but they're coming in with a concern about Big Ag, that's a very different conversation than somebody coming in with a concern about GMO safety, right? And so you know, really trying to understand what exactly is motivating people for some of their questions that they have and respecting the understandings that they're bringing to that conversation, I think is really critical.

So there is a pretty wide body of literature on this topic like people's motivated reasonings, cognitive dissonance, the ways in which identity and political affiliation and understandings of how people operate in the world plays a role in how they understand and interpret science information.

But my personal perspective is that this is really about relational work. It's really about trust building on a small scale and like by relationship building, by understanding what people's concerns are, you can unpack what some of those misconceptions might be, or just helping them have a more open perspective.

And then the other piece of it, of course, is that institutions have really had a lot of degradation of trust, over the past few decades. And so just wanting to make sure that representatives from big institutions have a grounding in community and the ways in which listening needs to happen.

ERUM: I think those are very good strategies, but as Genspace, you guys are promoting a lot of bioliteracy, is there a specific tactic that has worked where you saw someone? Convert, into being more bioliterate?

BETH: Yeah. I'm just gonna be blunt with you. I don't necessarily approach it from a lens of wanting to convince people. I want them to have an understanding of what their personal values are and how that intersects with emerging tech.

So I don't see it as my role or my goal to convince people that biotech is good. Because it may not be right? There might be some cases where it may not be, right? And so wanting to really understand that there are social, historical, and economic drivers that are motivating people that are not just about whether or not this technology can solve this big issue. It really is about who is going to have access to that technology? Is it really gonna benefit certain communities? So those kinds of critical

conversations I think are really important. And for me, I wanna make sure that there's space for that. That it doesn't come with a blanket. We did that already with plastic, "but plastic will solve all of our problems." And like, here we are, right?

ERUM: Oh, snap. Yeah.

BETH: And so we wanted, I just really wanna make space for more nuanced conversations and respect for people's experiences.

ERUM: That's great. Yeah. Thanks so much for that. So you've seen a lot of innovations happening or people's ideas and everything from a small scale idea to like products that are in the market, and of course you're probably observing what's happening in the industry. Do you have any bioproducts that you admire?

BETH: Yeah, I'm, so again, I'm coming from a very classic biology background. I grew up in biomedicine. So people really focused us a lot on biopharma and therapeutics and how can we make new oligos and gene therapies and blah, blah, blah.

Add Oligos Definition

Beth mentions Oligos. In the scientific parlance or in the life sciences, when you talk about an oligo you're probably talking about a short sequence of dna. N a though it could be r n a, and that is something that you would also buy from a company like Twist or GenScript or GeneWiz. There's several of these companies that provide oligos as a service to anybody that needs those kinds of sequences.

Outro Definition

BETH: So for me, coming into a place like Genspace, what's really opened my eyes is the biomaterial space. I've been absolutely floored by the innovations that are coming outta companies like Werewool, like TomTechs, Ecovative, like MycoWorks, Bolt Threads and Modern Meadow, like all of them. I'm just so fascinated by the fact that they took biology to make a thing that lives in the world now.

KARL: Because biology takes a thing and it lives in the world.

ERUM: Yeah. And you can literally grow everything. Hence the name of the podcast.

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BETH: I'm so thrilled. It is both like a fascinating inspiration of learning from and with nature, but also really thinking about the human element and how we design for a more sustainable future. It just, it really gets me jazzed to hear about the things that people are making with our materials.

KARL: Yeah, I agree a hundred percent. I was like, wait, this is what I always thought biotech was gonna do. I forgot. Because I got so focused on the biopharma side of it.

ERUM: One of the things that you mentioned was that, to help with bioliteracy, people need to be curious and be interested and a lot of that happens through television shows, books, other kinds of media. Do you have a favorite biotech book or movie or show that you can share with the audience?

BETH: Yeah, I have so many, but the one that's really captured my attention recently is this really cheesy teen drama called *The Imperfects*. It's about a mad scientist gun-rogue and he experimented on some children and genetically engineered them or stem cell therapy them or something. And then as a result, as they're growing up, they're starting to get these really weird superpowers. The science is like a complete mess. I'm just gonna state that as it is shenanigans. But it's really funny to watch and it's engaging for me as a science person to watch the ways in which people are positioning these like emerging technologies.

Things like CRISPR, stem cell therapies, all sort of interesting things that they're working on in this storyline. The way that they're framing them, the way that they're positioning them, they even use the term biohacker, which, maybe some of your audience will know, is a phrase that sometimes Genspace uses as a way of unpacking

who gets to do science. Biohacking is fundamentally about taking science outside of traditional academic and industry spaces and creating equitable access for people to do it themselves or to do it in a community setting. At least that's how we understand biohacking.

And so they use the term biohacker as like the villain of this story and these nefarious people who are trying to hack the science and try to recreate this other scientist thing but they're also using it for evil. And so it's like hearing some of these framings, it's very entertaining for me, but I also recognize that could create some messaging that we should maybe address.

But it's a really fun story. It's got great representation of races, ages, ethnicities. It's, gender orientation, like there's the representation piece of it is really fun. It's a fun watch. It's very silly.

KARL: But then have you seen the actual biohackers series? Yes. On Netflix. The German ones. Oh my god.

BETH: Yes.

Grow Everything Interview Transcript: Beth Tuck

KARL: Yeah, exactly. I couldn't watch season two because I could barely get through season one.

BETH: Yeah. But what I appreciate about these stories, whether they're fictional or documentary films or whether they're science fiction books or whatever they happen to be, is that they open up conversations, they're conversation starters. And for a lot of people, like if that's their entry point, they got a lot of questions. And I love people coming from a place of questions. It opens conversation in a way that allows you to really engage with them to understand what their concerns are, to understand what their motivations are, rather than making assumptions about what really is and what really isn't possible. like, I feel like I walk out of those conversations nine times outta 10 being like, it's not possible yet, but maybe in some future world. And oftentimes people are just disappointed at the state of the science.

KARL: I remember having those conversations at Genspace with people who wanted to do things. I was like, yeah, I don't think that can be done yet, but keep.

BETH: Yeah, that's right. Because we don't know where the future holds. exactly. We, I would never would've imagined something like CRISPR existing, a couple of decades ago and now

KARL: Right! Who knows what else nature has for us, that we haven't uncovered yet. I mean I think it's really, that's super important.

ERUM: You are this community space, I know you mentioned middle school teachers coming there. Like what type of partnerships do you have to be able to really bring people into Genspace? Do you have any partnerships?

BETH: Yeah. We've worked with a lot of groups over the years. Everything from like the World Science Festival, and of course, Ellen's Ted Talk has reached millions of viewers, right? Like those sorts of things in terms of the big scale. My personal interest is really on the small scale. I like working with individual groups, individual teams, and really thinking about ways to get deeper, and give them that opportunity to experience something that they wouldn't otherwise get to.

So we worked a lot with different organizations like Girls Inc, Stem From Dance. We've been working with a small nonprofit in our neighborhood called Sunset Spark, who works with communities in the local environment. And we plan programs together. We do hands-on science together. It really is about opening the doors.

A lot of the time that science lives behind closed doors, it's not really easily accessible both physically, technically, as well as language accessibility, right? There's a lot of terms and things that are like, "I don't even know what the word genome means. How do I understand what genome engineering is?"

Grow Everything Interview Transcript: Beth Tuck

Or things like that where you if in partnership you work with these organizations to help understand like what are the things that they wanna know? What are the things that they wanna understand and collaboratively build programming together. But we also do, other events like, one of my favorites from before Pandemic. We worked with Pioneer Works, which maybe you'll know as an art tech heavy organization, really missional language and space in a lot of ways. and we did a second Sunday's program with them right around Valentine's Day, where we did this like large scale public genetic testing of people.

We tested this oxytocin receptor gene to see if people are genetically inclined to be cuddly or not. We got hundreds of people spit in tubes and swabbing and all sorts of things, and we just did the PCR right there in their space. So it's just, things like that where we can create opportunities for conversation around science technology, but also the ethics, the access, the for who and for what purpose. And that space making, I think is what we do best and we do with partners.

KARL: Yeah. I think that you need to revive that for next Valentine's Day. I love Pioneer Works. I think it's a fantastic space. And I think that also really speaks to this idea of, you're not gonna necessarily find a place like Pioneer Works that would partner with Genspace, unless you're in an urban setting, right? if you were in a small city, Ventura, California. The number of places where you're gonna be able to do those kinds of collaborations is gonna be much more limited. But I guess you could do 'em from a distance.

BETH: Yeah, definitely but it is, more fun to do it in person and live, right?

And so I think that's one of the things that we like about being in New York is like you said, the concentration of people, organizations, industries. It's that concentration factor that makes it easier to randomly bump into somebody who you can imagine something really wild with. And so, the ability to meet people that have complimentary audiences or complimentary processes, I think is what makes the partnership stuff fun.

KARL: I think that one of the things that you mentioned that I thought was really exciting is this idea of having a retiree sitting in a class next to an eighth grader, both critiquing each other or taking inspiration from each other. Like, that I find to be very unusual, and I think that's gotta be the future that we're creating.

BETH: Yeah, that's the hope, right? And again, people keep hearing about this biotech, they hear about this bioeconomy, they have a lot of questions, they have a lot of curiosity, and there just are not that many opportunities or spaces where they can get hands on access to what this stuff really means. What's the practical, physical application or experience of it? And that, I think is, again, one of the unique things about being in a large city like New York is we have the capacity and the opportunity to make a space like this.

KARL: Yeah, I think the bioeconomy thing is really interesting. That's something we've been talking about because the executive order, we felt like it didn't get as much news as we thought it would've gotten. And I think a lot of it is because people just don't even know what the bioeconomy is. On one hand it's just a small section of the economy or sub-sector of the economy, but it's growing.

And I think that's one of those areas where people don't understand because it's still underground? We can't really say that. There are products that we use everyday that come from the bioeconomy and from biotech companies. Maybe that's like a class idea, Beth, a class on what exactly is bioeconomy and how do you fit into it.

BETH: Yeah, and I think that's a big thing too for me, thinking about the equity and access is it opens up career paths. If kids don't know. What it means to be a material scientist or a fermentation engineer, like they would never seek that out. It could be a really important, lucrative opportunity for them to build out financial stability for themselves and their families.

And so there's something really important to unpack the language of bioeconomy, unpacking the language of what stuff really means so that people can say, oh yeah, I can grow yeast in a container and watch it spin. I think the language access, to me, is a really crucial piece of this; it's like we use so much technical terminology and so much jargon and it's really off-putting for communities who don't normally have access to these things or they feel like it's not for them but if you really look at it, it's stuff that they, especially community knowledge, indigenous knowledge, they literally have been doing this stuff for centuries. So you know, if you start to really understand what knowledge they're bringing from their own homes, their own communities, their own experiences, their lived experiences if there are easy ties to start making.

KARL: Yeah, it's interesting because it reminds me of two recent conversations that we've had. Speaking of Arye, he's one of the co-founders of [LabDAO](#). Which, basically, the idea is to be able to distribute laboratory services globally. And his thesis is that people who build their service on the platform will be very successful because there is a lot of lab equipment all over the world that only gets used, less than 20% of the time than it's designed for. But then the other thing, about language and not understanding, we just had a conversation yesterday with someone talking about these family-owned contract manufacturing organizations that are basically fermentation sites. And, they're basically built by a family. They service companies all

over the world. And there's a lot of room for a lot more of those. It fits into the whole thing about microbreweries. People wouldn't be starting those if there wasn't money to be made.

And I think that some people are gonna start to see, or if they understood that this was a possible career path, then it would give them the inspiration to think, okay, I'm gonna start a contract manufacturing organization that specializes in producing whatever, using this one by manufacturing modality.

BETH: Yeah, I think that to me is what's really exciting about the ways in which this bioeconomy could grow. And again, like thinking about a space like New York City where real estate is limited, these like small batch manufacturing is gonna be really important.

ERUM: Have you thought about the importance of being in person and getting your hands dirty, and— this is all in Brooklyn. There's only one Genspace. Can there be more Genspaces or are there plans to make more Genspaces or do you have any comments on more community labs in the United States or in the world?

BETH: So Genspace is part of a global network of community labs and community lab-ish groups. In the US, there are at least probably 10 or 15, maybe more, labs like Genspace scattered mostly in the major cities, but there's also some surprising places where they've sprung up. And in some cities, there are multiple community labs so these spaces definitely are implementable in other urban settings especially. Because again, there's this concentration of scientific capital, creative capital, access to resources, financial capital, and other bits and bobs that really are important for making these spaces work.

And like my personal wishlist dream, of course, is to grow our physical lab. We wanna have more space and to be able to grow our facilities. Like right now we're a BSL1 lab. We really wanna be able to grow and to be able to offer BSL2. so people could do tissue culture, tissue engineering, and other innovative work there. But also to try to think about satellites and spaces where we could operate, where we don't necessarily have to have the full physical presence, but we could be doing more programming or more hands-on science that's a little bit more neighborhood oriented, a little bit more geographically focused. And then my really serious big dream, my home and my roots in Appalachia. I would really love to be able to be doing more stuff that isn't urban necessarily personally, because I, I really do believe that there's innovation and talent in these rural settings.

They just don't have access to the resources, supplies, mentors. innovation network that you have in an urban hub. And so how can we think about either remote engagement or mobile engagement, or other ways of supporting the rural innovators as well?

Grow Everything Interview Transcript: Beth Tuck

KARL: Yeah, that's a super important point and it speaks to, what we've been talking about in terms of urban biotech and what its relationship should be with rural biotech, because, creativity is everywhere and we need all creativity and all solutions to be applied to those big problems that humanity is facing.

Is there anything else, Beth, that you think we should have covered that we didn't?

BETH: Yeah, I guess I just wanna make sure that I emphasize ways to get in touch, so if you're curious to learn more about Genspace, the programming that we do, and ways to get involved either by teaching, volunteering, or joining the lab. Most of all of our information can be found on our website. It's just Genspace.org and we're on all of the major social media channels @Genspacenyc. So those are the easiest ways to get in touch.

KARL: Fantastic. All right. thank you so much, Beth. We really appreciate talking to you today.

BETH: Yeah, thank you so much for having me. This was super fun.

Transition

KARL: Well that was a fantastic interview.

ERUM: Yeah, Beth is a very clear science communicator. She speaks to and for the people, I loved everything she said.

KARL: Yeah. It wasn't until we were in it that I was thinking, that I speak really fast, because you're a much more precise speaker, Erum, than I am. I definitely tend to try to put a lot of information out there very quickly. I think Beth speaks faster than I do, but she is very clear. She's a very good communicator.

ERUM: I think one of the big things that really resonated with me that she said was, that talent is everywhere, but opportunities are not. And I think that's really, really important for our industry in biotech.

I mean, of course there are opportunities and there are going to be more as the industry grows, but what those opportunities are, who can access them, right? The talent is everywhere now. As she mentioned younger people or anyone may not know that there are jobs to be a fermentation specialist. And what really is that it's like cooking at a large scale, that's one way of thinking about it.

KARL: Yeah. Isn't your brother a fermentation specialist?

ERUM: I mean, he, works at Siemens and makes reagents on a large scale, so he has this certification to do that. But I talked to him about, what's going on in biotech. He

had no idea about, synthetic biology and fermenting, to make different products, everything from leather to cement. He had no idea. And he's actually very scientifically inclined. He's a very smart guy, so,, I'm surprised that he didn't. But this goes to show the lack of exposure of this biotech industry that people don't really know what's going on. We have to talk about it.

KARL: Yeah, no, it's true. We're talking about fermentation for a minute. I've probably mentioned that last year I was in Europe for a symbio thought leadership conference. And one of the big topics of conversation was the need for more fermentation facilities. And right now the way I understand it is, there is a bottleneck when it comes to getting large-scale fermentation facilities. I think the industry is gonna solve this relatively soon, but there are a lot of opportunities on the job side for people who are interested in fermenting, and not just beer or cider, but actually producing products.

The other thing that, Beth said, is this idea that Genspace is a third space. It's not your house, it's not, your job, it's another space.

ERUM: When you're at home or when you're at your office or a third space, you just think differently. Your environment makes you think differently, and of course, you meet different people. So Genspace, being that third space helps you explore your own curiosity in Beth's words. That's something that I think is really important. You and I are very, very curious people. Maybe to our–

KARL: No, it's not to our detriment. It's our superpower. It's among our superpowers. Is that insatiable curiosity.

ERUM: Yeah. We definitely go over down a lot of rabbit holes, but it is, it is really good because we do uncover a lot of things and we ask a lot of questions.

KARL: We talked about community at the beginning and the people we've met there, this idea that Genspace does a lot of community outreach. They work with a lot of students who might not normally be exposed to the possibilities of biotechnology and the life sciences. And I think that that is God's work. We need a lot more of that. We need spaces like Genspace everywhere.

And what makes it interesting is when you get people who are, let's say BioCurious, which is the name of another community biospace in the Bay Area, when you get people who are BioCurious, the age doesn't matter, the demographic doesn't matter. What you share is this curiosity about the life sciences, this fascination with the way it works with the things you might potentially do with it. And it doesn't matter whether you're, 10 years old or 70 years old. If you have that curiosity and you're in this community, you are gonna have people who support each other and move things forward. And that can be very infectious and very, very important to the bigger world. From a motivation point of view, you're more motivated when you're around people, who share that same curiosity as you.

ERUM: Yeah. And not just the curiosities, there's also , the need. Something that I think we should talk about in a future episode is the whole concept of biohacking.

There's a lot of solutions in biotechnology, especially for people that have an untreatable disease. It's a very gray area because of course you don't want people treating themselves for a disease that maybe a doctor or another drug can treat. But at the same time, if you have no options, biotechnology can offer a solution if you know how to use it and to create those therapies. But I'm opening up a door to a conversation we could have in the future.

KARL: You and I have offline been talking about drug pricing and the price of therapies and how expensive they are, and I think we need to find some people that we can bring on to talk about that.

But continuing this thread of education in science, literacy, and bioliteracy. I really want to get [Natalie Kuldell](#) of BioBuilder or [Karen Ingram](#), who wrote the BioBuilder book, which is about teaching middle grades teachers how to teach synthetic biology, and Natalie has been a friend of ours, we'll call her a friend of the pod, and so I think we need to get her on to talk about what she's doing, the efforts that she's done, how things have changed over the years. That was some of the insight that I got from talking to Beth is, how the lab has changed, and how what they do has changed. And I think all these things work together to increase awareness of what's happening in this field and in this community.

ERUM: Awesome. Thank you Beth. Hopefully you're listening and your team and your community. We love Genspace and we will see you soon.

KARL: Before we close out, I just wanted to do a quick shout-out to Jacob Barnett, who's a listener of ours who wrote us a really nice note.

Jacob is finishing his PhD at Amherst and he was very inspired by our conversation with Cas Smith. And we're actually gonna talk to Jake because he didn't realize that science communications at the level that we do, was something, and it sparked an interest in him.

And this has actually happened with us, with Jordan who works with us. She had no idea that science communication was a thing. , she ended up becoming an intern. We ended up hiring her last year. She's become a very important part of the Messaging Lab team. But we really appreciate Jake reaching out and telling us about what he is doing. He's doing some fantastic work in organismic and evolutionary biology, and so we appreciate the shout-out and welcome you, listener, to please let us know what you're thinking about.

This is your podcast. We have a good time doing it, and we've got a lot of good stuff coming.

Grow Everything Interview Transcript: Beth Tuck

ERUM: Check out our show notes. We have lots of, ways of communicating, if you have any ideas of specific topics that you want us to discuss or people that you think we should interview, please let us know. Just give us a shout-out on any of those channels. Yes, we're still on Twitter. please reach out.

KARL: All right, thanks a lot, until the next episode. Talk to you soon.

ERUM: Bye!