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Transcript for Back to School series, Season 2 Episode 2: “The Path to STEM: High School to Grad School”
Released September 9, 2019

STEMculture Podcast 0:07
[Intro music]

Will 0:16
Welcome to STEMculture Podcast. Today we are talking about why you should consider a STEM career and how to get there if you're in high school or undergrad. More specifically, we'll talk about the kinds of things that will improve your prospects at every stage of STEM careers. A penny in time, as they say, those activities that we're going to talk about are finding mentors, networking, research, synthesis, and finding funding. And we're going to talk about how you can do those at every step along the way, and also, why it's important to do them. What we mean by STEM career in this case, is any path that leads you into work in STEM fields. This includes associates of science, Bachelor's of Science, Masters of Science, and even a stem PhD, and maybe other degrees, and then any job that might require one of those degrees or experiences. Today, you have myself Will,

Brooke 1:20
Brooke,

Moncie 1:21
and Moncie. This episode goes out to the labor unionists of the late 19th century, thanks for Labor Day.

Will 1:30
So first, posing a question that some people might be thinking about, why wouldn't people consider a STEM degree, everyone's not interested in STEM, and that's fine. But I'd like to try and clear up some misconceptions and, and hopefully make it so that people aren't making decisions that will affect their lives, for the wrong reasons. So I'd like to start by talking about sort of two sides, of the same bad penny. And those are ignorance, culture, and stem elitism. So what do I mean by those two things? So ignorance, culture is a thing that I think most of us who have gone to school, at least in the United States have experienced, which is, if you're too interested in, in class, if you're too engaged, if you ask too many questions, if you seem like you're enjoying yourself too much, then you're a nerd. And so it's, it becomes cool, to not care about science, not care about education. So that's what I mean by ignorance culture. And then I think, what's really the, the opposite side of the same issue, which is a cultural issue is what I'm calling STEM elitism. And what I mean by that is, when people who are involved in science think, Oh, well, we're better than you because we're scientists. And I think that those two things sort of feed off of each other and end up creating a bunch of negativity that that really doesn't have anything to

do with STEM at all. It's just people having bad attitudes one way or the other. So, did you guys experience that in school, or other places? [laughter]

Moncie 3:27
So when I was in high school, I wasn't really interested in science, I was kind of, I didn't even really know what it was. And I really my most, I guess, influential experience was the frog dissection, a biology class, and I hated that. I don't remember anybody teasing other people for being nerds, I think it was more like a larger divide of Who are you a, you know, part of the group of people who are into, you know, English and writing and stuff like that, versus I guess, the jocks and stuff like that. And in university, I was at sort of a nerd school. So it's actually cool to be a nerd. So I didn't actually experience that. How about you Brooke?

Brooke 4:12
I really didn't. I don't know. I think I was always interested in science. But never, I think I've said this before, I never really thought science was for me, just because it was... I struggled a lot in high school. And so yeah, to me, it wasn't a "Oh, you're a nerd if you like science", it was kind of like, that's so far out of my reach. Like, it wasn't even something I, I felt like was a box I can check of like, I can openly even say I'm interested in science, because it wasn't it was like, just just make it through school. And who cares what you're interested in? I don't know.

Will 5:01
Yeah, I'm really glad you brought that up. Because I feel like I mean, I think that's even an idea that's what's perpetuated by teachers sometimes where they sort of say, "Oh, well, you know, the the science and mathematics, those are only for certain people".

Brooke 5:17
Yeah!

Will 5:18
And, you know, it doesn't matter what you're interested in, you know, if you don't get an A in my science class and fourth grade, it's probably not for you. And that's just not true.

Brooke 5:29
Yeah, yeah, I, I think that grades... Well, I don't know, that's a whole other discussion. But I don't think grades are really a representation of where you're going to end up or what your interests are,

Will 5:45
Yeah no, it, there's so many things that can affect your performance in every level of education, that, you know, it really, I mean, I think your interests and interests that you really go out and develop yourself and not are, you know, depending on the experiences that you have in class, I think those should really hopefully drive what people pursue and end up doing, because that's what's going to make you happy.

Brooke 6:13
Yeah.

Will 6:14
And, and I don't think that whether or not you liked your, you know, your 10th grade frog dissection should keep you from science.

Brooke 6:24
Yeah.

I actually can kind of pull a little bit of an experience from my oldest son, because he always was math and science minded. And that that was culture at a very young age, it probably helps that I was in college while he was younger. And he also had teachers that always provided opportunities to learn about that. And so being his grade school, it was cool to like science, like, how often do you find, I guess, a grade school situation where it's cool to like science. But then when he came into high school, we move states, different, different atmosphere, sports was the focus. And he was going to high school, going to college, working. And because of that, he really struggled in sports, not that he wasn't good at it, but that he would be penalized for being late, because he was coming from a college class, his science college classes. So I think, you know, sometimes the school systems are definitely set up to penalize people who are trying to do other things beyond what the focus of whatever that school is. A little bit of a downer. [laughter]

Will 7:56
It's a great thing to think about, right? I mean, how much of what you think of as a positive experience is due to the way that the institution you're at is set up? As opposed to what you like? So I think that's I think it's important for everybody to think about,

Brooke 8:13
Yeah, I think that your point is duly noted.

Will 8:18
Okay, so enough of that. [laughter] To play the devil's advocate, I think we all we all understand, there are plenty of reasons why people would not consider a STEM career. And if you don't like science, technology, education, engineering, or mathematics, that is fine. But we also want to talk about some of the reasons why you would consider a STEM career.

Brooke 8:43
Yeah, so I think that going into a STEM track is something that you'll get quite a bit of educational support for. So there's a lot of, I think, funding opportunities for going into a graduate program. And that that varies for every school that you're applying for. But a lot of PhD programs specifically, are funded. And so a great, it's a great way to get training, essentially for your your career path, and get paid at the same time. And often times, they have a tuition remission program. And a lot of colleges and universities, they really want to grow their STEM programs, they they want those numbers to keep growing, because that means more research is being done. A lot of research is done by PhD or master's students. And so that just grows their programs to have more graduate students. And like I mentioned, you can get paid to get an advanced degree. I mean, that's pretty cool. I I think it's pretty awesome that I'm learning, and I'm getting paid to learn. I I don't know, I just think that's kind of a dream training program right there.

Will 10:11
Yeah.

Brooke 10:12
Oh, and science is pretty, pretty awesome. Just saying, yeah. [laughter]

Will 10:18
It's like a pretty powerful way of looking at the world. Yeah. And it's ingrained in so much of the stuff that we sort of take for granted and live with and depend on.

Brooke 10:33
We all got iPhones.

Will 10:34
Right? Yeah.

Moncie 10:39
So we kind of like to think of the STEM degree, as a gateway drug to a science career. So first of all, it helps you develop skills and quantitative thinking, it helps you conduct critical thinking, and it helps you develop technical skills. And all those things can be used for a huge variety of jobs there, I think people that get degrees STEM and then end up somewhere they didn't even expect to be but because they have those quantitative skills, and those technical skills they can, that translates into so many other bigger things than even just, you know, staying in academia or going into industry.

Will 11:15
Yeah, so there are a lot of different jobs that you can do in general. But what are jobs that you can do that are going to give you competitive pay, that are going to have growth prospects, and also are going to give you manage manageable stress and give you some work life, integration, work life balance, depending on how you like to talk about that. And I think that there's a misconception that science jobs and STEM related jobs are necessarily more stressful. And I think that goes back to people associating science class with bad experiences in grade school and high school, maybe also undergrad. But actually, that may not be the case. So we took a look at a US News analysis of Bureau of Labor Statistics data, which is a regularly updated database. And the US News goes through and looks at these statistics on a regular basis. And they, they rank a bunch of different jobs, according to some of those things that I mentioned. So median pay, how people really rate their stress levels at work, and a bunch of other things. And we'll link the methods and also the the newly updated analysis in the show notes. But a couple of things about the results of this, this meta analysis, I guess you might even call it, it doesn't include academia. So science degrees, whether it be a BS, MS, or or PhD, don't necessarily have to lead to academia. And actually, most of the ways that you can go are not academia. So in this list of 2019's, best jobs, the top 30 of them are all STEM related jobs. And then if you look through the rest of the list, by far, most of them involve those skills that Moncie was talking about. Quantitative thinking, critical thinking, technical skills, and so many other things that you get out of a STEM degree. Our society is going in a particular direction, and having some of these kinds of skills that you might get from a stem degree could do really well for you, for your future. So you guys have any thoughts about all that?

Brooke 13:56
I think when you get into a graduate program, whether it's a master's or a PhD, there's a lot of focus on jobs within academia. And I think that it's important to realize that they're like Will said, there's so many more jobs that are outside of academia that are really fantastic and amazing, and a lot of fun, and very fulfilling. And so I think it's really important to know that going in to applying to graduate schools in general, is that the main focus there often times is an academic position. But that's, you know, look broadly, I would say, I have to agree with keep an open mind before you go in.

Moncie 14:50
Yeah, absolutely. Yeah, I can definitely have a lot to say about that, actually. Because I ended up so I actually kept my industry job while I was working through my PhD and did some fun side intermittent work, and then had a position created for me when I actually before I even graduated, I went back to full time. But there are things I wish I'd been thinking about in terms of that job, while I was in school, there's stuff that I wish, Oh, I wish I'd taken that class, this would have really helped me out in my consulting job. And so yeah, I agree that the focus is largely staying in academia. And you kind of have to seek out those things for yourself, whether it's taking extra classes or developing a new method, you know, learning how to do HPLC or something like that. Yeah, you really have to almost seek it independently

Will 14:54
What's with the acronyms?

Moncie 15:39
Yeah, sorry about that.

Brooke 15:40
One of my favorite things to do... I do this more than I'd like to admit, but it's kind of my like, "Can I make it to the end inspiration"? I like to job search, because I like to look and see jobs I'm interested in and the skills that they're looking for. Can I get those skills now on my way to my degree? Or is that something I'm, you know, I want to be building those skills now instead of when I'm done, and then trying to play catch up. So yeah, one of I think a great place to start is just look at what jobs you might be interested in? Are, can you get those skills throughout your degree? I know, I reach out to other areas to get skills that I want that match those jobs.

Will 16:35
I think that's such a cool thing to do. And

Brooke 16:40
I might have a three ring binder. [laughter]

Moncie 16:45
So smart.

Will 16:48
I'm sure that it's a coincidence that you suggest that we do a job search for this episode.

Brooke 16:54
It might have been, but whatever! [laughter]

Will 16:57
So snarky. I actually really enjoyed doing that. And I think that it's such an incredible idea. Because I mean, for one thing, it it shows you if you're a mid mid degree, it shows you that the things that you're learning, or the kinds of things that you could learn are actually marketable skills. So if you're in the middle of a BS, and you just wonder, what in the heck am I going to use those biostatistics that I just learned? For? Yeah, and you go out and you find job listings for people that have skills that that you've learned in one of your classes, or as a research experience, which we know we'll talk about some of that stuff later. Wow, that's a great feeling. And one of the coolest things, we're also going to talk about mentors later. But one of the coolest things. My current advisor who's awesome, actually, at one point, sent me a job listing for a person with skills that he knew that I had. Wow. So like, yeah, I mean, it's not just you. There are people and like, and you know, you can you can do this with your friends, if you know what kind of skills they have. I think it's a really cool thing. So anyway, without further ado, do you guys want to talk about our job searches?

Brooke 18:17
Yes!

Will 18:17
Okay. Brooke, it's your idea. So you go first.

Brooke 18:20

So I picked this one. And sometimes I have a hard time sleeping. And so I might peruse random job searches on my iPhone, at night. And so I found this one. And I actually emailed it to somebody who I thought, wow, this sounds like something that would be right up their alley. And not because they had a specific degree that only targeted this type of job. It's because they had a general degree and something that had the skills that they could apply to this job. Like, they could apply those skills to the techniques that are necessary to do this job. So um, it's forensic toxicology fellow. And they would work directly with a chief toxicologist in a forensic aspect. And the person that I sent it to, is an analytical chemist, but not with a focus on forensics. And what I thought was really cool is that in the requirements section, they require somebody to have a PhD in toxicology, or pharmacology, or chemistry or a related physical science. And so it really shows you that one, having the PhD shows that you have the fortitude to make it through a project from the very beginning, creating the project, putting forth the idea, following through to the end, and coming out with an end product. So that right there shows that you can take whatever skill you have, and apply it in a new way, towards whatever job that's necessary. So I thought that was kind of a fun, fun thing, because we've had conversations with this person quite a bit about how they didn't think that they could apply to a forensic type job, even though they love forensics, and they're an analytical chemist. And I was like, absolutely, just look at jobs that need analytical chemists. So yeah, that was my job.

Moncie 18:22
I love that. I want to apply.

Brooke 20:48
I know. I know, me, too. I want to. Will do you have a job?

Will 20:57
I did three.

Brooke 20:58
Ooooh overachiever!

Will 21:03
Okay, so the first one I did is Forester. So this is a, I mean, man the list of responsibilities is really wide and interesting sounding, but I'll just read the top one: That provides technical advice with a collection, compilation, storage, analysis, reporting and distribution of strategic annual multi resource forest inventory data. So basically, you're going to go out and hang out in the forest. And like, figure out, figure out what's there and how to analyze it and what should be stored and what should be reported. But like, you're basically an Ent. I mean, yeah, yeah. In this job and, and like,

Brooke 21:56
and getting paid for it

Will 21:57
by the US government.

Brooke 21:58
Yeah.

Will 21:59
And to get this job, you have to have a four year science degree. So a BS in a related field. So if you go out and get a BS in biology, probably you can apply for this US Forest Service foresters job,

That's pretty bomb.

I mean, I'm several years into my PhD, and I'm thinking about applying. So I'll, I won't bore you with all of them. But....

Brooke 22:27
No, I want to know!

Will 22:28
The other one that was more sort of like, in track for you know where I am, myself, is computational biologist at Johns Hopkins University Applied Physics Laboratory. Excuse me? A biologist working at an Applied Physics Laboratory?

Brooke 22:50
Please tell me more. [laughter]

Will 22:53
That job listing on this is so great. Oh, by the way, I got my jobs from Glassdoor. com, which is super easy to use free. And it has a whole lot of stuff. Man, I I scrolled through, I don't know, 6, 7, 8 pages. And that was just the first ones that I saw. Okay, so this is just the job listing? Do you love exploring large biological data sets to describe complex interactions and inform experimental research?

Brooke 23:22
Yes.

Will 23:24
Are you passionate about new groundbreaking research in the microbiome?

Brooke 23:29
Yes!

Will 23:30
If so, we're looking for you to join our team in the biological sciences group at the Johns Hopkins University Applied Physics Laboratory

Brooke 23:41
I'm applying!

Will 23:42
I mean, really, really cool stuff. This would mostly be a computer job dealing with big data sets and understanding analytic techniques and visualization of data and stuff like that, which is hundred percent the kind of thing that I want to do. So let's see. Minimum requirements: bachelor's or master's degree in computational biology, chemical engineering, biological engineering, or relevant field. Five years professional experience. Okay, so I expect that probably, my PhD might qualify me for this.

Brooke 24:21
Yes.

Will 24:23
And guess what the salary ranges?

Brooke 24:27
I'm gonna say 70 to 80?

Will 24:32
Moncie, any guesses?

Moncie 24:33
A hundred thousand.

Will 24:37
Hundred thousand dollars is the low end.

Brooke 24:40
Ooooh!

Will 24:41
150,000 a year is the estimated salary. So... But, I mean, even though my, my current plan is to look for tenure track positions at a university, this is a real possibility for me. And looking at this makes me feel good, because it's like, man, you know, if the if the ivory tower research position thing doesn't work out? I'm going to have options.

Brooke 25:14
Absolutely.

Will 25:15
And so as you heard from the the forester with the US Forest Forest Service, through the computational biologist, I mean, I was just looking for stuff that fit my qualifications, probably pretty much anyone out there who's even mid bachelor's could find a way. And like you were saying, look at those requirements and start building them.

Brooke 25:35
Yeah!

Will 25:36
And be at a place in a department in a university, where the resources are available, and the expertise is available for them to learn the things they need to learn to get one of these awesome jobs.

Brooke 25:46
Yes, absolutely. Yeah. And like what Moncie was saying is, you know, if you know that there's a specific class that might benefit you, that's offered at your university, take it. Because you never know how listing that class on your resume will completely change your ability to get the job that you're going for. So even if it's not within your degree plan, there's a lot of times some wiggle room on whether those classes can apply towards your overall degree. So I think that's a really important thing to keep in mind as well. A lot of the things that I look for in those jobs is what type of computer languages are they wanting me to have? So that I can learn on my own, I don't have to take a class for that I can, you know, find the resources I need on my own. But if it's something that you think you might need, like learning how to use an instrument, maybe the university offers a class just specifically on that instrument.

Will 26:55
Yeah. Yeah. And they have the instrument.

Brooke 26:57
Right. Whereas you're not going to find that maybe out in industry.

Will 27:01
Yeah, so if you're talking about, you know, programming or some textbook type, subject that you might need to learn, you know, you can probably find it online class or something like that, but being at a university in a degree program. Yeah, you're gonna have access to all kinds of things like, high pressure liquid chromatographs. Looking at you Moncie. [laughter] She needed to define her terminology.

Moncie 27:30
That's how I roll.

Will 27:33
Do you have any jobs you want to share?

Moncie 27:35
So I'm actually looking at Corteva Agroscience. So this is one of those new big mega companies. So it's a combination of Dow, and DuPont. Oh, yeah, if you're interested in working on the dark side of things. [laughter] So there's some really cool, interesting jobs here, actually developing chemicals. And I'm not I'm on the other side of that - I'm against the chemical development idea, in using lots of pesticides in crops, but they are trying to develop green chemistry, green chemicals at this point. And so I think that's kind of where the industry is trying to head. So I think it's kind of a cool area of research and work. So you're basically getting paid to go do research and try out new formulations of pesticides. And yeah, do a slew of toxicity tests. And yeah, just interesting stuff.

Brooke 28:23
Yeah, yeah.

So many cool things. Alright, so let's address how you can make yourself more competitive for a STEM career. Small investments in STEM experiences early on, can pay off big time. And can really open doors that maybe you didn't have any idea would have even been a door, right? So, I think it's really important to highlight what some of the key activities are that you can start really anytime in preparing for a STEM career.

Moncie 29:05
So let's start out by talking about mentors. So we wanted to give you an idea of why it's important to be able to identify them, how to know what good mentorship is, and how to find mentors. So first, I think there might be a misconception about what mentoring is and where you can find it. And there's actually a lot of different places where you can find a mentor, that can be through official or unofficial channels, doesn't necessarily have to be something like an undergraduate advisor. It can be a manager, or a professor, a postdoc, or even a graduate student. So for example, my first mentor was an 85 year old man who ran his own solar energy nonprofit. I started off as a secretary for him, and learned a little bit about what he was doing and got really excited by it, would listen to him, you know, be in his meetings with other with grad students, and they were talking about the different projects that they were working on, it was the first time I actually got interested in science and technology. And it was actually what helped me pick what I was going to do for the rest of my life, I decided to go into environmental science, because of this mentor, who I knew for years thereafter, and who unfortunately passed away several years ago. So there's other ways to find mentors that are a little bit more, I guess, straightforward. So for example, there's a clearinghouse for STEM mentoring that contains links to websites for organizations that provide mentoring. This particular project has a lot of focus on women and minorities, which is really important. It's called the National Girls Collaborative Project. We can provide you with the web link in our show notes, so that you can access that, that's just got a huge, vast array of resources for people, even if you're not a woman, or a minority. Also, ask questions and show your interest. Don't be afraid to go up to your high school teacher, or professor and ask them more about something that interests you. And sometimes even it's good to ask them about what interests

them, you know, what excites them about what they're doing. And one way, one of the things that can come out of this, if they see how interested you are in and how engaged you are, they might actually choose you. And I've had that happen before also. And that's always really exciting to get an email from a professor saying, hey, I'd really love it, if you could come work in my lab. That's a great feeling. So a lot of people were saying, we said, we actually sent out a tweet from STEMculture, asking what was useful to people in pursuing a STEM career in high school and undergrad. And they said that this method of just talking to teachers, and expressing interest actually got them mentors in terms of the mentor actually chose them. So that's pretty cool.

Will 31:41
So what makes a good mentor?

Moncie 31:44
What makes a good mentor? That's a great question. So there is no, there are no guidelines for often for mentorship. You know, what does that mean? I think it means a lot of different things to different people. I think it's also important to recognize that it's probably good to have multiple mentors, because not any one mentor can provide you with what you need. And that's okay. But I think a good mentor is somebody who actually understands where you're coming from, and may have even, be able to relate to you in some way. And who can suss out what you need, and can direct you to other places where you can find what you need. So it's somebody who can recognize what their limitations are, and give you some kind of commitment that's going to help you further your goals, but also can tell you, Hey, you know, this is another person that you could go talk to you, that can be helpful to you. So it's somebody who was actually has some humility, who realizes they can't be everything to you.

Brooke 32:38
Yeah, I think that's a great definition of a good mentor.

Will 32:42
Yeah, I think I think one of the things that that that is a subtext there that they're providing you with some things, and, you know, access to their experience and expertise. I think are important parts of that, and then also things like encouragement and perspective, things that you can't necessarily have unless you've been in a field for a while.

Brooke 33:09
Yeah. Yeah. They can kind of navigate or I guess, help you navigate bumps, or roadblocks that they might have come across in the, during their journeys.

Will 33:23
Yeah, but I think I think also that they should be invested in your success. Yeah. And, and, and sometimes it can be hard to, to find good mentors, and to sort out somebody who's really genuinely a mentor from somebody who's just sort of going through the motions. And this is, like a lot of the things that we're going to talk about probably something that, that you need to have some experience in, to be able to identify when somebody is genuinely interested in seeing you go places.

Brooke 34:02
Yeah.

Will 34:04
But it's very important. So finding mentors is actually sort of like a subtype of networking, which is the next thing that that we want to talk about. So networking is, is the act of building a set of contacts that are interested in and working on things that are similar to your interest in your work. And this is important because it can help build future collaborations and opportunities and support like mentorship

for you. So first of all, some sort of basic social aspects of networking. One thing to realize is that people love to talk about themselves. There's nothing wrong with that, you know, you hopefully care about what you're doing, you work hard at it, and you should be willing to talk about it if somebody wants to hear. So like, once he said, with mentors, you know, asking them what they're working on is a great way to start a conversation, which is really the beginning of networking, just starting the conversation. Remember that you're not inconveniencing people, people who you're talking to, especially if it's at, you know, something like a conference or some kind of event that has to do with the field that you're that you're studying. They want to network too. So you're not inconveniencing people by talking to them and and trying to see whether or not they would fit into a good network for you. This also goes for reaching out to people remotely. So sending someone an email, hey, I looked at your lab web page, super interested in the kind of research that you're doing there, I had this question? Do you know someone who is familiar with this technique, just as an example. You know, it may be that the first person that you email about that is not the right person, and they can point you to someone who can help you. But you've now made contact with that person. And that's the first step towards integrating them into your network. Another thing to keep in mind when you're trying to engage in networking is to have grit. So you need to mentally prepare for the possibility that people are going to sort of say no, either explicitly or implicitly, whether they just don't return your email, or they don't seem very interested in the conversation. You know, science is collaborative. So why would somebody say no, in whatever more less constructive way they did. Most often, it's probably just because they don't have any time. Time is something that we all run short on, and people who are, you know, PIs, Principal Investigators of research groups, often have lots of demands on their time. The same thing goes for postdocs, and graduate students all the way down the line. I'm sure every person listening to this feels like they have lots of demands on their time. So just realize that probably a non-response or negative response has more to do with what that person is dealing with, then your request to, to establish contact with them. And then the last thing for networking is go to conferences, go to events, get yourself out there, whether it's a local microscopy conference, or, you know, a national biophysics conference, or or, you know, any any kind of STEM related event, at any level, is exactly a opportunity for networking and for getting you contact with other scientists and, and vice versa. So get yourself out there, put a face to the name, if you've already made contact with some of these people, make yourself a known quantity. So if people know you, they've talked to you in person, you're a human being to them. Now, you're not just a name on a page. And this can help you through every level of going through a STEM career. So another really great way to network is on social media, and our co-host, Dani, is amazing at the Twitters. There are things like hashtags, like academic chatter, and PhD chatter, and a whole bunch of others that can connect with science and provide like a really easy way to see what people are doing just when you're walking around day to day. And then there's things like LinkedIn, that often there'll be lab web pages and things like that you can find, to connect with people without even having to go anywhere. And a lot of times, these are things where, where people are advertising that they want to make connections, with people like you who are interested in what they're studying. And Dani and other hosts are going to talk about that in a future episode. But all this networking stuff is really important because science is too big for any one person to do by themselves. And so you need other people and other people's ideas to make it all make sense.

Brooke 39:53
So now we're going to talk about synthesis, which is exactly like, how is all of this going to fit together? Where is it going? And why do you need to know all of these things? So kind of looking at the big picture? You know, when you're looking at science, you really need to know, how does this fit in to the world, society and your life. So you, you need to know how the things that you're interested in what type of an impact will it make on the world around you. And that's going to be the driving force behind the questions that you're asking in science. And then looking at collaboration, that's the really great thing about science is that it is based on open sharing of ideas, you know, science moves forward by people sharing what they found, and finding new ways of using that information as well. And so then there's this idea of collaboration, which is open sharing of ideas, and most science jobs, STEM jobs,

STEM careers, you will be collaborating, because science doesn't happen in a vacuum. And so you really need to be able to share across different types of sciences. And then with that, you are going to be collaborating with a lot of people from a, you know, from the beginning. So, you know, in high school, we all start out with the dreaded group projects. And we've all had those group projects where there's maybe five non-contributors and two contributors or one contributor, and often times, it's you, right? So you can really start feeling out at a very early stage in your STEM career, who's good at collaborating, and who's bad at collaborating. So nurture this, because a lot of times, everybody just complains about the group project- I know I did. And looking back on it, that was great training for what I am doing now, reaching out to mentors who I want to work with and who I can see what their their working style is. Are they good at communicating? Are they good at contributing ideas? Are they good at not taking your ideas and using it for their own benefit? And are they good at maybe, when you come up with an idea? Are they acknowledging it? And the same for you, you can do the same thing in that aspect and nurture your collaboration skills, how are you giving to the project, because everything you do in STEM will have a collaborative aspect to it. And so then, on top of this idea, we really need to kind of examine that science is not just this analytical space, it's a very creative space. And a lot of scientists come in and say, I know how to do X, Y, and Z, but I don't, I'm not creative. I've heard that over and over and over again, I'm just not creative. I don't do crafts, or I don't build things or but that's, that's the thing is like all science, it is creativity. If you're if you know, whatever field that you're really interested in, and you're asking questions on Well, what if I can do this? Or what if I did it this way? How would it end up? That's creativity. So we need to not think of it as you know, it not being some sort of an art form, because science truly is art. It's one of my creative outlets. And so I think not allowing yourself to be creative within the STEM sphere, will really limit your ability to do great things with science.

Moncie 44:28
I love that. Yeah, absolutely. So I've done a lot of fieldwork. Field studies, and the design of those studies is so crucial to the questions that you're asking. And all that design, all those design elements, everything from what is the slope of the stream that I'm using, and when what am I going to cover the stream in? And what animals am I going to put into that stream? That's all creativity, right? It's a living piece of art, if you will. So yeah, I completely relate to that.

Will 44:55
Yeah, there's 1000 little, how am I going to do this thing's for every lab experiment that I've ever been involved in. Almost never is it like, Oh, well, you know, here are the 10 steps that you're going to do. And that's everything works out the way it's supposed to. Never is it like that and and that is, that is I think one of the things that the undergrads that I've worked with, and hopefully been a good mentor to, one of the things that that they are most often completely unprepared for. The idea that, that this is not going to be an explored space. You know, I mean, that's what science is doing is exploring new territory, just like the Star Trek Enterprise, as he adjusts his glasses. [laughter]

Brooke 45:54
So I kind of want to flip this on its head a little bit because maybe there are individuals out there that say, I'm not interested in STEM. I think you had mentioned that, Moncie. I'm talking to Moncie right now. I think, if she had mentioned that in high school, that wasn't something that she was interested in at all, but she's a highly creative person. So you could be a highly creative person and not realize that STEM needs that creativity. And maybe that's what's keeping you from STEM is that you think, well, I'm creative. I'm not sciencey. Well, but science needs that.

Moncie 46:37
Absolutely.

Will 46:39

So yeah, like we were saying, research and science are actually creative endeavors. And I think that there's just a little bit more buy-in maybe, to get to a point where you really feel that those creative juices flowing, but it's there. And, and so, I think the next thing we're going to do is to try and give you an idea of what research really is. And also then, how to get started in a research, research group or lab. So what is research,? I would say, when you're starting, trying to figure out what your field of interest really is, like, what what the latest science in your field of interest says, requires that you read research articles. And this is not something that they really teach in high school or even undergrad a lot of times. But this is where all of it is, in primary research articles in science journals. And the great part about this is that if you've got an internet connection, and also, hopefully access to a library, a university library, you can just get on the internet and start reading. One of the downsides to this that I sort of just alluded to is that sometimes, these research articles are going to be hidden behind paywalls. So you'll find something on the Googles. And click on it. And PNAS will tell you that you need to pay $35 to read this article. Another thing you can do is email the authors. So a lot of times even if an article is hidden behind a paywall, the authors will very happily send you the article for free. So the first thing is getting research articles. The second thing that is reading research articles.

Brooke 48:53
And I think a lot of them are excited that somebody is actually reaching out and asking for that paper that they put a lot of time and energy into. So they will happily, like you said, send it your way.

Will 49:06
Yes, absolutely. Yeah. And and and you can actually even think of it as maybe like, you know, you might be making a scientist's day.

Brooke 49:15
Absolutely.

Will 49:16
I can't wait.

I don't have any articles published yet. But when I do, email me, and I'll send it to you. [laughter] So how do you guys read research articles?

Brooke 49:30
I think, you know, I spent a lot of time, in my earlier days of learning the field that I came into reading everything in the article. And that's a lot of time to read every little word in the article and try to digest everything, but I felt like there was, it is it's really technical. And it's hard to understand, especially if you've never experienced maybe any of the lab work that they're talking about, and you don't understand why they're doing the steps that they're doing. But I felt like that was necessary for me to get a grasp on the field I was entering into. Once I became comfortable with the terminology, because really, you're learning a new language when you're reading those papers. It is like learning French or Latin or whatever language. It's just, you need to know the terminology and and use it appropriately in order to do more searches on the internet. But now I look at, you know, what were their questions? I try to find out right away, what was the aim of the paper? Once I have that idea down, I go to the conclusion. Were they able to conclude what they had set forth to do? If they did, then I go into the methods and really try to like tease out what they did that was different maybe than other papers that I've read. Do their figures in the paper show, are they an accurate representation of what they're claiming? Because there's good papers, and there's bad papers out there. And that's, that's a hard thing to really weed through. If it's if it's good or bad if they if they analyze the data correctly, but you'll get there, that just comes with time.

Will 51:37

Yeah, I think being skeptical, even from the beginning, is valid and good. Yeah. So, you know, when I started reading research articles, yeah, I totally second, all the things that you were saying about, you know, takes a lot of time to sort of get used to the way people write, because every, when you read a research research article, what you find out is that is that every word in every sentence is chosen meticulously.

Brooke 52:02
Very meticulously.

Will 52:04
If you expect it to get into a good journal, you have to make sure that you're saying things in a way that the people in that field are going to recognize. So you write research papers, sort of with, with the full weight of the field, behind you, and, and needing to fit into that. So if you get into reading a research article, and you're like, man, it just took me a day to read the first page of this! That's normal.

Brooke 52:32
Yeah, that's I wish somebody had told me that's normal. Because man, I felt like I was so behind the curve.

Will 52:39
The other thing is that we are reading skeptically. So needing to be convinced, don't read it like a textbook, especially if it's a primary research article, you should read it like, Okay. You know, they're trying to convince me that they showed something. So let them convince me, and you may not always be convinced. And part of that could be the way that they write things is unclear. That happens quite a lot. Science writing is a challenge. And not everybody is equally good at it. And, and so that, like Brooke was saying there are bad, bad papers out there. And there are badly written papers out there. Another part of it is the science could be good, or the science could be bad. But this is all part of getting into STEM, getting into a STEM career, you understand, you have to understand your field.

Brooke 53:36
Yeah. And being able to untangle those things as kind of an upper level accomplishment that I don't even feel I have even come close to mastering, but being able to kind of glean out methods. You know, I think I can cover that at least. So don't feel like you need to be a master at it within it, like a couple months. That's not gonna happen.

Will 54:00
Yeah, no, but this is really something that you can definitely start as an undergrad. You know, and get help from your science network and your mentors.

Brooke 54:10
Yeah. You know, a lot of schools, they'll have a, not a book club, but a article club, where they, they can cover one paper pretty thoroughly, a month or every two weeks. And that's a great way to learn how to read a research article as well.

Will 54:31
Yeah, working with a group, that goes back to collaboration.

Brooke 54:34
Yeah. Another way that you can really find opportunities out there for research is open science night. And I really like to plug this one because this is what got me interested in the field that I'm in now. It was in Arizona, University of Arizona has a wonderful open to the public science night that they were doing at the time. And it brought in thousands of people and had a different topic every every week. And I

went in, and it just kind of changed my passion in life. It really opened my eyes to something that I just never thought, I didn't even have any idea that it was even a thing. And so I believe that a lot of universities participate in this because they want to make things open to the public, they don't they really want to kind of demystify what's going on behind closed doors at universities. So reach out to your local college and see what they have, you know, maybe it's something they not might not do every year or every month, but see if they have something that brings in the local community to see what's going on at the university.

Will 56:02
Yeah, and I know that, that Dani wanted us to mention an experience that she had as a high school student, which is sort of like that, but specifically for high school students. So Dani went to a program called Cosmos at UC Santa Cruz. And you can find that on the web, if you just Google "cosmos, UC Santa Cruz", you'll find it. And basically, this is a system that sets up undergrads in their junior and senior between their junior and senior in high school, with labs, to get them in and get them some experience on college campuses, taking some college classes and actually doing lab work, or research as a high school student. There are, I know programs like this also at our university. And things like this can be a great opportunity to get in and see how the mechanics of setting up an experiment, actually performing an experiment. And then seeing what you got doing some data analysis. And writing about it all looks like. So those things that I just mentioned are sort of some of the other parts of research. So knowing the field is only half the battle, once you know the field, you're going to work with people to figure out basically one step that you can take in some direction, to answer a question about the field. And that's the big idea of research. And the way that that happens is usually you'll design an experiment that carefully teases out one particular answer to one question, you'll perform it, and then you'll see what you got. And I think probably, this is the kind of thing that we can talk about all day long. But until you get in and you become a part of it, it's never going to really completely click. So high school students out there, and definitely undergrads, approach PIs, approach advisors and professors who have labs and are doing research. There's something that you can do to help them.

Moncie 58:25
Yeah, absolutely. Even if it's something small, like, I'm going to process some leaf samples for this researcher. It's it's easy, and they're always looking for, for free labor. Yes, excited about the work. So yeah, you just you just have to ask, and it doesn't hurt to ask.

Brooke 58:41
Usually, if you prove yourself in one small task that you can do it well and enthusiastically, they will look at you for the next bigger project. And then if you prove yourself that way, you know, a lot of times, researchers will want people that they can trust to come in and work and by by being willing to do the little things in the beginning without, you know, complaining or saying you would rather do something bigger, they're going to consider you for the bigger ones the next time.

Moncie 59:18
Absolutely. Yeah, I think that's a great point.

Will 59:21
Yeah. So they're going to value things like attention to detail. Bring a notebook. Anytime you're walking into lab to learn a technique or you're meeting people, honestly, having a notebook and a writing instrument, anytime you're planning on doing any STEM-related activity is a good idea. But especially if you're walking into a lab, you should have a notebook, even a dedicated lab notebook.

Brooke 59:45

That's a really great point. Because if you come in and you write down every little step, you will you will learn those techniques so much faster. And you're not going to be asking the same question a million times, you're going to be asking new questions each time.

Will 1:00:04
And you're going to get it right. So when they hand off the project to you, they're going to feel good about having you there. As opposed to somebody who had less attention to detail there. And like Brooke said, here and earlier, this is opening doors. Having a professor at a university on your side is a great thing. If you are hoping to get into an undergraduate program, get into a graduate program, have recommendation letters for jobs, all of these things. Professors at universities carry weight. And this is a great way to, to impress one.

Moncie 1:00:48
Yes, absolutely. Yeah. And don't be afraid to ask all the questions. Yeah. So you know, I always have, I've got great respect for, so I manage a number of people on the contract that I work on and, and I have this one particular employee who just, he has just a million questions. And I love that about him, because I know, that tells me that he's actually paying attention. And it tells me that his eye's on the ball, he knows what's going on. And he wants to understand why he's doing things. So don't turn out to be afraid of that authority figure, try to get as much knowledge as you can from them. Because most of the time, they're usually happy to share that with you. And it shows them that you are really engaged.

Will 1:01:25
Yeah, yeah. I actually just recently said to, to somebody that I'm working with, when somebody I'm training. And I'm not a huge expert, I've probably, I probably trained, I don't know, half a dozen, or maybe a few more than that, undergrads and in in different techniques. And at this point, one thing I think I've learned as someone who trains people is, is that if you're not asking questions, I'm going to assume that you didn't understand anything. [laughter] You're completely lost, falling asleep, and drooling. [laughter] And I'm going to have to explain all this again. So ask questions. It doesn't make you look dumb. It makes you look smart.

Yes, absolutely. Yeah. [laughter]

So that's all well and good. Get into research, become a scientist. But what's it going to cost you?

Lots and lots of money. [laughter]

Moncie 1:02:33
So we want to help demystify how money works in STEM education. And kind of the the take home message here is that you may be able to get a STEM education without having to pay for it. And get paid to do what you like. So let's talk about, let's break it down a little bit. So first, let's talk about scholarships, grants, loans, tuition, tuition remission, there's a lot of words there. Yeah, we might want to, we might want to define those in the show notes for everybody.

Brooke 1:03:02
Oh, that's a great idea, let's do that!

Moncie 1:03:03
Yeah, but we can also, you know, briefly touch on them now. So I like to think of scholarships and grants as sort of that, you know, free money that you don't have to pay back. Same with tuition remission. And then there's things like loans where obviously you do have to pay them back. So it's, be careful there. And then there's interest involved, there is interest involved in many other things. So grants, that's a really intimidating word, I think, for a lot of people. So where do you start with that? And when do you

start? Honestly, you can start in high school, and definitely start in undergrad. First, where you can start looking is for internal grants and scholarships. So a lot of high schools, and universities have sections of their websites that are devoted to internal grant opportunities. So when I went to University of Maryland, Baltimore County for my undergrad, and I have a number of internal grants that are on my transcripts that helped fund my education, which was fantastic. We're also looking at things like government funding. So for example, I don't know if anybody's heard of Sea Grant or Space Grant before, but they provide a number of scholarships and undergraduate and graduate fellowships. Now Will here is very special, he has an experience with Space Grant, he'd like to briefly share with you.

Will 1:04:16
First, what, what are these grants and fellowships? What do they pay for? What, I mean, you said it's free money, but what can you use the money for?

Moncie 1:04:24
It depends.

Will 1:04:25
Yeah, all different kinds of things. I mean, basically, it's, it's usually competitive. But basically, you can, you can pay for them, it's sometimes the materials to do the research. Sometimes your living costs. And then fellowships oftentimes, are more geared towards your living costs or, or other costs that, that you experienced, personally, while you're studying and doing research. So that, the space grant in particular, is, is aimed at developing future employee, employees in NASA-related fields. So NASA is the National Aeronautics and Space Administration. So you think aeronautics and space, I'm not interested in anything to do with that. But you got to think they're interested in anything that is involved in air flight and, and putting things into space, from the ground, to what happens to people in space. So this includes a really wide variety of fields, many of which, you know, it may include some things that you're interested in. And so you should really go and take a look at the Space Grant and also the Sea Grant websites to see if the stuff that you study could be supported by Space Grant. And also, whether or not the institution you're at has a Space Grant or a Seed Grant associated with it. So I did Space Grant research, looking at a model of the Earth's magnetic field. And basically it it paid me to do research for a summer. And it was enough to cover my rent, basically, for that summer of research. And I got to work directly with a faculty member and actually participate in real real research as an undergrad. And I wouldn't have been able to do it without the Space Grant.

Brooke 1:06:37
That's very cool.

Moncie 1:06:38
Yeah, that's awesome. So another way to think about applying for a grant, or something similar to that, is to look out for topics that interest you in your classes, and actually reach out to your professors with ideas that you have for research. I have a great example of this. And it's me. So I had this really great professor that taught, it was a cultural geography class. And he was very much into, you know, the studies of climate change, and urban geography. And I just really liked the way that he looked at the world. So I actually went to him and started talking to him about, you know, greenhouse gas emissions inventories, and, you know, sustainability. And he and I ended up sort of creating a research consortium of undergrads and we actually wrote an EPA grant together. So the benefit of that was that I was getting grant writing experience. And I was also getting a big fish's name on my grant, right? So he was actually spearheading the grant. And we were both getting this great thing out of it from each other. And we actually got that grant, and our group got to go to DC and present at a sustainability forum. It was very cool. And together, we also performed UMBC's first official greenhouse gas emissions inventory. So this was a huge project that involved getting data from all across the university from the different departments and different, what is it called, facilities management groups, it's usually very hard to get

data from them, they don't want to share the electricity data, the how much waste are they generating, but we were able to get all of that data and do this very cool thing that set the stage for UMBC becoming a leader in sustainability.

Brooke 1:08:22
Wow, so incredible.

Moncie 1:08:25
So we don't want to get too deep into this, because we are thinking about having an episode later that's going to focus on this. But try not to be too scared of paying for college and grad school. We definitely it's, it kind of depends on how you look at it, I'm not going to say go spend as much money as you can on your education, right? Because college education has increased in price over the years and doesn't seem to be decreasing anytime soon, you should definitely be smart about where you're going and the money that you're spending. But also don't let that deter you from getting an education. So for example, the place that I went was for to the Federal Direct Loan Program. So rather than going to a private lender, where there are much more strict rules for engagement, using this Federal Direct Loan Program, you have a lot of advantages. So first, if you're over 25, and you apply, so you can't apply if you're under 25. That's kind of a tricky sticking point, you have to have your parents apply. And that's kind of a separate arm of this Direct Loan Program. But if you're over 25, you apply, there's no credit check. If you get subsidized loans, you don't pay interest while you're in school, or while your loan is in a debt, what they call a deferment, a deferment or forbearance. And then we can get into those terms into that later episode. But to suffice it to say, if you're in school, or you have a reason for why you can't pay, you're not going to pay interest with subsidized. The government also offers a number of fair repayment options, which are income based often. And the cool thing is, if you can't pay it off in 20 years, then the loans are written off. And that is a huge, huge bonus. So if you went private, and you've got a huge amount of student loans, you're paying those back, and there probably isn't going to be any kind of income contingent payment plan. Another thing to think about is that departments often pay student stipends for being a teaching assistant or what they call a TA. And also faculty can pay for your stipend with the research funds, and they might put you on what they call a research assistantship or an RA.

Will 1:10:26
Yeah, I think that this is that that last thing if you're, if you're talking about grad school, I think that that's really a good thing to look for is a PI or principal investigator, which is pretty much the same thing as an advisor, research advisor, who has funding to support you with. And so that's going to do a few things for you, that's going to show you that they can get grants, they can get funding, because if they don't have funding, then maybe that's a shortcoming of their's, and that's not going to be something that they can help teach you how to do. So that in itself is something you need to learn from them. But then the other part of it is that you don't have to worry about how to pay for your master's, for example, or your PhD. But I think one thing I wanted to mention to sort of like, tie the whole funding section together, is that there are a number of sources of funding out there. But they're often things that you have to go looking for and apply to. So these are things that you can get help with, reach out to people, reach out to us. Talk to your mentors. So to tie sort of all of these five activities that we've been talking about together a little bit more. So those were finding mentors, networking, doing research, synthesis, and finding funding, each of us is going to talk a little bit about experiences that we've had, that involves all of these activities at various stages in our careers or that we know about.

Moncie 1:12:13
So I'd like to briefly talk about the National Science Foundation Research Experience for Undergraduates. It's something I'm pretty passionate about. You generally apply for it in your junior year of undergrad, and you have your experience in the summer of that year. So what it is, is there are a number of field sites across the country. They have different areas of research, there could be forestry, it could be aquaculture, any kind of ecology, there's a number of things that they focus on. So the

particular one that I did was in Maryland, and I was working off of the Chesapeake Bay, which is an estuary there. And the cool thing about it is that it's a full experience. So you're paid a full stipend, so I paid almost $4,000 for the summer, and you have paid housing, so you stay on a campus or at a research facility. So you have your own space where you can cook or, you know, eat meals with the other undergraduates or even graduate students that are on site. And you do your research, you have a research project that you develop yourself, you have a mentor, and there are workshops. So I learned how to create an effective PowerPoint, I learned about the ethics of publishing as a junior in high school in undergrad. Which is crazy, right? Because we never did, well, it's certain graduate institutions, you will never really talk about that. And you certainly won't have a course in it. Turns out, it's really important. So we had some really great conversations and my eyes were really opened up to the world of science in a way that that wouldn't have happened if it weren't for this experience. So after going through it, you then present to the community. And it was very intimidating, but I made it through and it was it was so awesome. So you have this product, you've got something to show for it. Right. So you've done this networking, you have this great mentor, you have a research project, you followed it all the way from inception to finality, and then you walk out and then you have this great thing on your resume. So I highly recommend it to anybody. And it's very easy to look for, we have the website that we'll put on the show notes. So you can check that out for yourself.

Brooke 1:14:21
That is very, very cool. One of the things that I would like to talk about is also with the NSF, it is their Graduate Research Fellowship Program. And it is to help you through graduate school, it basically pays your tuition for three years. And it also pays you a stipend for three years. And it also allows you to be eligible for other programs for just GRFP fellows. So it's one of those things that can help connect you to other funding opportunities in the future as well. And it is available to undergraduates in their senior year to apply. And it is also available to graduate students who do not have a Master's previously, or if you're in a Master's, you can apply for it, but you need to have under 34 graduate student hours, I believe. So that's a really powerful thing to be able to apply for. Because it essentially means that you have the power to choose where you do your graduate studies. And usually, if you have that universities are very enthusiastic about bringing you on into their graduate program. And then you also are not obligated to teach in order to earn your wage, which means that you have more time to focus on your classes and your research. So you can really get a lot done in in your years at graduate school. And it can lead to future opportunities and networking and, and such.

Will 1:16:24
Cool, well, I already mentioned my Space Grant experience. And just to flush that out a little bit more, with respect to our activities that we're talking about. I mentioned that I got to work with a professor. But I got direct one on one experience with a research faculty member as an undergraduate explaining concepts and looking at my work. In that case, it was computer code, and then also helping me develop presentation and, and working on my presentation style. And there's a lot really of mentorship that went on there. The the program concluded, the summer program concluded with a Space Grant colloquium where a bunch of people from a number of different departments got together and listened to presentations from all the Space Grant recipients. So I got to present my work in front of a whole bunch of people who were studying related things, which was a great networking, opportunity. Participating and all that really helped me to understand, you know, how one approaches understanding a particular research project in the context of, of the greater field. So that was a great opportunity for me. Another program that I don't have experience with personally, but I've heard a fair amount of it about lately is the McNair Scholars Program, which is specifically for first generation students. And it's really designed to sort of help get you into doing all of these things. And this is another thing that I hope that we're going to have an episode specifically about because they do great work. The story behind the program is really inspirational. But also because it's a great model for how to approach going through undergrad in a way that will get you into a competitive grad program. So that's the McNair Scholars Program, you can find them on the web as well.

Brooke 1:18:42
We'd like to know how well we did at getting some of these points across to you. So we would like to ask you to reach out to us on Twitter or Facebook and fill out the poll that we have there. Just also it lets us know how we're doing in informing you on some of our topics that we have. So you'll answer the following questions. And that is: I know why I might consider pursuing a STEM career. I know how to start preparing myself to make myself competitive for a STEM career. I know what the grant writing process is and what the NSF GRFP is. And I can do government funded research as an undergrad. So give us a shout out. Take our Twitter poll, let us know how we're doing.

Moncie 1:19:35
We talked about why and how to pursue education and careers in STEM. We live in a society that is infused with STEM at every level and the future seems to be only going further in that direction. Now is the time to start finding something instead that you're interested in doing. Early efforts will really pay off in the long run. But you don't have to do it alone. Like everything else in human life STEM is done together with other people. Find a mentor. Talk to your peers about an idea in science, look for grants that support the research you want to do. There are people and institutions out there who want to help get more people into STEM. Get plugged in today.

Brooke 1:20:13
Thank you so much for listening. Next time we'll be talking about grad school applications. Where Dani, myself, and Will will be talking about the process of finding and applying to graduate programs. We are on all the podcasting platforms. Please subscribe so you never miss an episode. You can also find STEMculture Podcast at STEMculture Podcast.com, or on Twitter, Facebook, or Instagram as STEMculture, one word, Podcast.

Will 1:20:45
If you like what we're doing, please support us on Patreon. We have two tiers right now: $1 and $5. At $1 you get warm fuzzy feelings and a thank you in our show notes. And at $5 you get access to extra Patreon content and our undying love. Everything we get from Patreon goes back into the show, not into our pockets. The microphones you're listening to us right now on somebody helped us out on Patreon. And we got them and we sound amazing.

Brooke 1:21:17
Yes.

Will 1:21:17
You know it. Until next time, don't forget to consensually hug a grad student or at least buy them a coffee or a 10 foot tall vegan build a bear.

BLOOPERS BEGIN
Moncie 1:21:35
My eyeballs are just gonna dry slide to the left to look at Brooke. [laughter]

Will 1:21:43
Corner of your eye, corner of your eye [laughter] That's right, hedgehog!

Brooke 1:21:49
Yeah! [laughter]

Moncie 1:21:51
Delete that one.

Brooke 1:21:52
Okay [laughter]

Will 1:21:56
Yes, master.

Moncie 1:21:58
Thank you. [laughter]

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