

Andrew: Hi, you're tuned into 90.7FM, KALX Berkeley. My name is Andrew Saintsing and this is The Graduates, the interview talk show where we speak with UC Berkeley graduate students about their work here on campus and around the world. Today I'm joined by Jing Chen from the department of molecular and cell biology. Hey Jing, how are you doing today?

Jingxun Chen: Good. How are you, Andrew?

Andrew: I'm doing well. Thank you for asking.

Jingxun Chen: Yeah, it's a little wet today.

Andrew: Yeah, kind of a bummer.

Jingxun Chen: Yeah. We do need some rain, though, in California,

Andrew: I guess so. I moved from the East Coast to get away from rain, but, oh well. All right, well, let's get started talking about your research here. Can you tell us a little bit about what you do on campus?

Jingxun Chen: Yeah. I'm a fifth year graduate student from Elçin Ünal's lab at the molecular and Cell Biology Department. The overall goal of our lab is to understand the process of sexual reproduction and how the DNA material, proteins and organelle can be distributed faithfully from generation to generation. For me particularly, I'm interested in the questions of how an organism can pass on genetic material faithfully to its next generation.

So, all of us have half of our genetic material from each of our parents. While we know that fact, we know way less about how our parents can distribute this DNA material faithfully, generation after generation. And that's exactly the key question to answer if, what happened if there are errors that occur in this process, which would result in genetic disorders such as Down's syndrome and miscarriages in human. For my graduate study, I investigate a protein complex, that's involved in distributing DNA in this sexual reproduction process.

And this protein complex is called the kinetochore, which is a physical structure that bridge between DNA and a machinery that actually pull chromosome apart called the microtubules. I study one tiny little protein in there. And what's interesting about this protein is that during sexual reproduction in the organism that I study, it fluctuates. It disappear for a while and then come back. And this fluctuation is important for separating the DNA faithfully. And so our laboratory, including myself, take part in understand how the production and destruction of this protein is controlled in this particular cell division event.

Andrew: What organism do you study?

Jingxun Chen: Yeah, I use this organism called budding yeast or baker's yeast. It's a single cell organism, it's very small. We actually all know about them. We add into our bread to make it rise, and that's the yeast that we use to study this process.

Andrew: Okay, so why do you use it instead of a human cell, if we're interested in humans.

Jingxun Chen: Yeah, that's a great question. So actually yeast share many, many things with us like the basic process by which it generates sex cells or gametes, they are very similar to human, but yeast this way easier to grow. You can grow them in a huge volume. There are many, many cells to study and they are very good with manipulation by genetic means.

So you can change their genetic material very easily. As a geneticist, we often ask the question, what would happen if you break something so we can generate mutants? I'm not sure if you guys know the movies that talks about mutant- can you guess what that movie is?

Andrew: The movie that talks about mutants? All I'm thinking of right now is X-Men. Is that what movie you're talking about?

Jingxun Chen: Exactly, right? So we talk about mutants, we ask "if we change our DNA material what would happen?"

Andrew: Wait, are you saying that if we change our DNA we could become the mutants from X-Men?

Jingxun Chen: Wow. I don't know about that. I won't go there but the thought is similar, right? If we change part of the DNA, we can generate what we call phenotype or things that can be different from the normal conditions. And then by doing that, we can ask "what's the function of this particular thing that you change?"

It's almost like you want to understand the function of an engine. You take apart part of the engine and ask, "well, what happened to the engine?" So, similarly, we can do some similar things to the budding yeast. We change its genetic material and ask what will happen to the process of sexual reproduction. And yeast is excellent in doing that. So we can put in foreign DNA, we can change this genome, and then we can study the process.

Andrew: How do you actually put in the foreign DNA?

Jingxun Chen: Yeah, yeast take up foreign DNA after heat shock. You can heat the cells to 42 degree and adding bunch of different solute and foreign DNA. They just are very good at taking up the foreign DNA and make changes in the genome, incorporating the DNA that they uptake.

Andrew: You just heat it up with DNA and the DNA goes into the yeast cell?

Jingxun Chen: The ballpark is exactly that. Yeah.

Andrew: Cool.

So that doesn't sound that complicated. Is that generally how you make mutants?

Jingxun Chen: Yeah, it's one of the way we do that, and now there're more sophisticated method like using CRISPR-Cas9 system, which I'm sure you'll hear more about from the Berkeley community later, but you can do more targeted engineering, but yeast are really good at that. Even before we can use CRISPR and Cas9.

Andrew: so yeasts have historically been useful, but maybe now we'll be seeing other organisms be more prominent as genetic manipulation becomes more easy?

Jingxun Chen: Absolutely. Yeah, but yeast still have the advantage of growing really fast, and we have a lot more microscopy or molecular biology tools that we can use to steady the process while other organism have their other aspect that they're advantageous of, but they're also disadvantaged compared to yeast.

Andrew: So what kind of tools... What do you do in a lab?

Jingxun Chen: We look at cells under microscope. We have fluorescent microscope where we can genetically manipulate a yeast cell to fluoresce after labeling different type of proteins. So we can watch them under microscope and see how these protein move around, how they change over different stages of the cell, dividing.

Andrew: When you say that you genetically manipulate it to fluoresce, that means...

Jingxun Chen: So you can put another protein on a protein that's expressed in yeast. And then when you shine light to that protein, because GFP, for example, will fluoresce, and then you can track the molecule that you actually attach the GFP onto.

Andrew: Cool.

Jingxun Chen: You can follow it over time. And so microscopy is a major part in our lab, running gels or these devices where you can separate protein by size and charge, and those will be another way to follow protein.

And there also, you can grow cells in different conditions, and you can put them on plates and look at their morphology change. Do they have weird shape? Do they grow a thicker cell wall or something? You can assess a lot of different things.

Andrew: So have you always been interested in this level of biology, this microscopic scale of biology?

Jingxun Chen: Yeah, funny thing, actually, I wasn't too interested in biology growing up. What I was very fascinated about when I was a little kid, you know, extreme weathers like tornadoes, like stars, the universe and all those kind of natural changes of, you know, colors and things that capture my eye more than a boring biology class where we learn about body parts and how does the heart work.

I didn't feel too captivated by that, but a switch kind of happened after I moved to the States. Actually I was born in China, and then I moved here for high school with my grandmother. That's when I met a wonderful biology teacher who completely changed my view about what biology about. In the class, we look at DNA replication models, you know, we pull apart these little balls and stick and try to put it back together to mimic what happened at the DNA level. We look at live cells under microscope. We can see these cells dividing, like onion tip. Who knew you have tracks of cells line up and just waiting to be divided?

And we watch videos, we do experiment, and it just, different, you know. Biology become an actual interesting subject rather than just a bunch of fact that we need to memorize. And so that changed my whole perspective and got me into biology.

Andrew: You'd say it was that one class, that one teacher?

Jingxun Chen: Yeah, I mean all it takes is one teacher, a good, caring teacher who show you a different aspect of what you didn't know before. That's all it takes.

Andrew: That was your first science class in high school?

Jingxun Chen: Yeah, it was, yeah, right after I moved to States. It was my first science class.

Andrew: So then from there you were just like, "all right, I'm going to be a biologist."

Jingxun Chen: Well, I mean, I love the subject of biology, but I would say, you know, in high school I struggle a lot and I... when I move here, I didn't know much about English, you know, it was, biology was one thing that I really felt passionate about and pushed me enough to learn the language.

So I enjoy the subject, obviously not enamored by the subject, but it's become sort of like a more intimate friend to me. So biology means a little different than a lot of people than myself.

Andrew: So biology pushed you to learn English. Biology pushed you to get to where you are now. It's like the driving force in your life.

Jingxun Chen: Absolutely, and the passion is very important. Like I learned the interesting part of it, and that motivate me to go on and learn different things. Like you know, "oh, I need to learn math, I need to learn physics, to actually know more about biology." It pushed me into many directions because I have this wonderful passion for this one subject.

Andrew: Because of your interest in biology, you ended up actually going on a lot of different tangential experiences. So you went through chemistry, you went through physics, you went through math.

Jingxun Chen: Yeah.

Andrew: So when you started applying to college, what were you even thinking about? Did you have no idea which field you really wanted to go into?

Jingxun Chen: Yeah, I wanted to study chemistry, because in biology I felt like, you know... To really understand biology well you need to know the chemistry. So I start out thinking of, "I will be a chemistry major," and, but then after first year in college I realized I still like biology the most and I decided to change it.

Andrew: So you took a class in chemistry and you just decided, "ah, I've got to get back to biology." Or you took a class in biology and said, "ah, this is where I belong."

Jingxun Chen: I know, I took a class in biology and say, "chemistry is cool, but biology is cooler still."

Andrew: So, you got to college. Where'd you go to undergrad?

Jingxun Chen: Yeah, I went to MIT in Cambridge.

Andrew: Okay, cool.

Jingxun Chen: It's a technology driven school, it's a wonderful environment. They have excellent teachers, and the people that they recruit, like the students' qualities are amazing. Yeah. I'm very fortunate to go to a very good college.

Andrew: Yeah. Did you have a lot of options? How'd you decide MIT?

Jingxun Chen: Yeah, so I was picking between several school, and MIT really caught my eye because... well, funny thing, they release their decision on Pi Day 3.14, so March 14. And when I was in high school, they have like a recruiter where they talk about MIT. So I didn't know much about college in general when I was in high school, but he was showing all these wonderful picture of hackers, like putting police car on top of the dome and then making nerdy jokes about things that only scientists may appreciate more, and I just felt like, "huh, that's a good place for me. I like being around nerds."

Andrew: Fair enough. Fair enough. All right, so you got to MIT, you were initially a chemistry major. But then you decided to go back to biology and then, so you decided you wanted to be a research biologist immediately?

Jingxun Chen: Yeah. It's interesting, because when I was in high school, I didn't know much about research. I knew that labs are fun, but I didn't know that there's actually career that you can build by just doing labs. So MIT has a wonderful undergraduate research program where actually 80% of the undergrad there are involved in that program. So you can apply and become an undergraduate researcher, and you can get credit or pay by being an undergrad researcher. So I just applied there, and there are many postings of which lab is accepting students and what project.

And I was fortunate to find a cell division lab that I didn't know that I would get in at all. And I apply, and my PI, Angelika Amon, just got back to me say, "yeah, let's talk." And I was like, "great!" Because I didn't have much experience and, and Angelika believe in me and took me in. And I was there for four years.

Andrew: Cool. Did you want to do the cell division because of the high school class where you looked at the cell division under the microscope?

Jingxun Chen: Yeah. So that's part of it, but mostly because that was the opening-

Andrew: Right.

Jingxun Chen: -that was offered.

Andrew: For sure, for sure, yeah.

Jingxun Chen: And then I just fell in love. Yeah, I enjoy every aspect of being in the lab and doing research and about basic science. And I have a wonderful post doc mentor, who now actually is my graduate advisor here at Berkeley. She show me everything about research, guide me too, and supporting every aspect of my career. It's amazing. I'm so fortunate and lucky to meet many great people along the way ,and she's definitely one of my greatest supporter.

Andrew: So you got into your undergraduate research position and that turns you towards deciding to be a biologist. So how did you end up at Berkeley for grad school?

Jingxun Chen: Yeah, that's a excellent question. I also have a backstory about that. So after my second year in college, I applied to this amazing program, it's called the Amgen Scholars Program. At the time there were only like nine research institute were holding this program, and Berkeley is one of them. So in this program, you basically working a new undergrad lab, and you have your independent projects. And the one that I was happily placed in was in Doug Koshland's lab at Berkeley. And he gave me a very interesting project.

For the first time I learned something completely new on my own and got exposed to the Berkeley community. So that's where I learned how to play softball with my lab mates and go to seminars, staring at a screen not knowing anything and talk about with people all the time. And it's a very supportive environment.

So by the time I was interviewing for graduate school, coming to Berkeley felt like coming home because I knew the people here. And finally what convinced me to come to this school was my director of the Amgen scholars program, Audrey Knowlton. She was also a biodiversity director here at Berkeley, and she talked to me on a phone for over an hour, talked about pros and cons and, and she just convinced me, Berkeley has the greatest people like herself, who I would like to surround myself with, who I want to become part of, and therefore I come to Berkeley.

Andrew: So every step of the way, it's just been like that one person that's just convinced you.

Jingxun Chen: Yeah, I know. That's the interesting part about life. Every turn around the corner you have a person lead you to the next step.

Andrew: So now you're here. You're at Berkeley. You've been here for five years now.

Jingxun Chen: That's right.

Andrew: We've already kind of talked about what you do in the lab. What's life like for you outside the lab? What else do you have to do as a graduate student?

Jingxun Chen: Yeah, that's also a great question. What we think about scientists is just doing pipetting or doing experiment in the lab. But actually our community, what we do is bigger than just doing little science.

So I got a chance to go to a lot of conferences where interact with other scientist. So, for example, one of the conference I often go to is the America Society of Cell Biology. It's a big conference with over, I would say maybe 800 people, over that. And people from different subdivision of cell biology come together, do poster, like PowerPoint presentation. You talk about science for a week. So we, as a scientist, we spend quite a bit of time in these gathering where we share our newest finding and discuss critically about each other's results. And those environments are also a big part of our graduate student life.

Andrew: Are you always talking about science with people or-

Jingxun Chen: Oh, yeah, no. So usually for these conferences you have scheduled talks, where you sit as audience, and there will be presenters, and they can do either poster presentation or PowerPoint. And then usually the program ends, maybe six o'clock. Sometimes there are evening sections, but most people just go out to socialize. Go to bars, have fun, and we talk about science, yeah, but also a lot of other things like surfing on the coast, going hiking, kayaking. Yeah, and our department also have retreats where we gather the lab members from several faculties' lab into a same place. And in Solmar, for example, near Monterey, where we give talks, but also more importantly have drinks and bonding event, fire. Yeah. All the cool stuff.

Andrew: I feel like in media, scientists just get portrayed just doing science all the time. But it's good to hear that scientists are like living their lives having fun. Right?

Jingxun Chen: No, absolutely. And I think, you know, the science community itself is a lot of fun, a lot of fun other than just about doing the [inaudible] thing, but also obviously that's our passion, but also all these events that bring out sort of more life experience part.

Andrew: So a lot of what you do as a scientist is communicating with other scientists about your science.

Jingxun Chen: Right.



Andrew: But then you also have to communicate with potential scientists. So you have to do a lot of teaching, right. So how is teaching going for you, or how has it been?

Jingxun Chen: No, it's great. I love teaching. As graduate students in the MCB departments, we need to teach two times. And actually, personally, I've taught three times because I just love it. So what we do, usually, we pair it up with faculty member who actually teach the class as lecturer. So the student will meet with the lecturer or the faculty member three times or two times a week and a teaching assistant, which our, what our roles are, would be to meet with a student in a separate time in a discussion section where we go over main concepts and do practice problem with them.

So we get to interface with about 20 or 30 students per class and meet them once a week to talk about those. And I just love it. I interact with many types of students. Some of them are really advanced, and we will show them in lab, and some of the undergrads join our lab that I taught. And some students who have less background, and that's where I need to learn how to be creative, explaining things and to understand where their needs are and try my best to provide an explanation or support to help them succeed in the class as well.

And that is hard, you know, knowing what to say so that people get something is not trivial. It takes experience, a lot of patience.

Andrew: Right. Do you ever just feel like you have to have four different ways to explain one thing before you even start a class? Just just in case somebody is going to ask you a question?

Jingxun Chen: Yeah, usually for me, I actually can never anticipate what kind of question I'm going to get. I generally have a guess of what the major confusion is, because usually for teaching assistant we also sit in the lecture. So sometimes I think we will get a sense of what is the easy point for confusion. So we will usually go over those in the discussion section first.

But obviously each student may have different blind spot, and they will come to office hour. Then we will, you know, sit with them trying to talk through what the confusion is and many strategy were needed, sometimes I need to dance in front of the class to make them understand something or sometimes use analogy like the engine analogy, like second ago that I used, that was coming from my teaching, I realized that help people understand.

So now it become part of my day to day conversation, you know, using analogy, making gestures, facial expressions, yeah. Teaching also become part of my life now.

Andrew: Nice. So you mentioned you teach all kinds of students at different levels. So some of the students you've taught have come into your lab. Actually, being a scientist, a big part of it is this mentorship, right? Teaching outside the classroom, inside the lab. How has that experience been for you?

Jingxun Chen: Yeah, it's great. I have a wonderful student who worked with me for the past year and a half. She joined a lab during her second to third year summer. And teaching someone who has no idea what research is for the first time is exciting and challenging, because the simplest thing that you saw for many times would be such a great excitement for someone who first see it, right?

Andrew: Right.

Jingxun Chen: So it's really refreshing to have someone new to work with me, and my student learn really fast and also seeing the growth is really impressive. And you know, that's the sense of fulfillment you get from teaching and mentoring is the growth of the person you're training. And that's what, in a sense, how I got to where I am. And so being able to give back and seeing that's the trajectory that people are going is very interesting and exciting for me.

Andrew: So mentorship is really important to you, right? You're involved in a outreach program centered around it.

Jingxun Chen: Yeah, yeah, absolutely. So Berkeley actually have many great outreach program. For example, the Young Scientists' program, the BASIS Program, The Expand for Horizon, which are different levels of mentoring, outreaching, and some of them for middle schools, some of them are elementary school and some are for girls to get into science. And the program that I am particularly involved in is called NIH Bridge to Bachelor programs or short for B2B program, which brings in underrepresented community college students to the Berkeley campus to do cutting edge research.

So our community college student come from the Bay Area, from Palo Alto or the Bay area. And then they come in to summer to do about 10 weeks of research and we pair them with a mentor who is passionate about mentorship, who would need to actually apply to our program. And then that mentor will basically allow the student to work in part of their project for the summer.

And then outside of that, actually day to day lab, as the coordinator, that's our role, we also structure weekly dinner with the students to talk about difficulties in labs, in life, sort of to give them more a safe environment for the student to share about what they learn in lab and what can be hard. And because these students come from a non-traditional background, the issue that they face is not

just scientific or academic but also you know, financial, social, and self confidence, right?

Those are the stuff that we work on during the summer with them as well. And at the end of the summer the student, they will be awesome scientists. So they will present their result as poster section and the lab that they work in and the greater community, their family, would come and see them being scientists. And so yeah, it's definitely a wonderful program and give a lot of meaning to the students and more for us, as the graduate student who worked with them and seeing the growth over time.

Andrew: It's kind of a program for both the graduate student and for the the undergraduate student.

Jingxun Chen: That's right. Yeah, so what's special of this program is actually, we recruit the mentors who are graduate student and postdoc directly, rather than a lot of other programs, we'll defer to the application of the student to the PI of the lab or the principal investigator or the head of the lab. And then from the the PI, then you would get assigned a student or a postdoc to work with. But now we took on more of an active role for the student, for the graduate student and the post doc to speak up for himself, "I want to be a mentor for the students." So we send that application to the whole community in Berkeley, IB, MCB, neuroscience biophysics, right, all the department.

And then we ask the student, ask the mentors to apply to our program by answering specific questions like, what are you going to do to summer? Like how do you interact with students, what your mentoring style is like, what's your background like?

So then after having the student and the mentors apply, and we know a little bit more about themselves and we will pair them up based on their interest and their background. And it worked pretty well so far because both party knew each other before they started the summer, and we knew that they were a good match.

Andrew: How long have you been doing this now?

Jingxun Chen: Yeah, so I joined two years ago. This would be my third year doing this.

Andrew: How have the students done since the summer that they spent at the program?

Jingxun Chen: Yeah, this program has actually have a longer history then when I joined. So this is a NIH funded program, so it actually has finished it's third renewals. So before then, when the program first started, we didn't recruit mentor directly. So it's a

bit more scattered in terms of student experience, whether they have a good mentor or not.

But since we started this new method of recruiting mentor directly, I would say most of our experiences have been positive. Students enjoy the program, and in terms of outcome-wise, like over 80% of our students transfer to four year college. And many of them are still majoring in STEM.

And yeah, some of them go onto graduate schools and become medical doctor. It's been a very transformative experience for us to see the students are continuing so well. It's definitely a great program to be in.

Andrew: Wow, that's really cool. Yeah.

We're getting towards the end of the interview. Is there anything you'd just like to say? Any messages you'd like to leave?

Jingxun Chen: Yeah, no, certainly, what I learned sort of throughout my whole sort of, moving to the States, you know, going to college, now deciding become a researcher. This whole process made me realize one simple fact, that just scientists can come from anywhere.

When I just moved here, I didn't know that I would become a scientist. I don't have any relative that were scientists, and not knowing the language really also make me self-doubt a little bit about whether I can be anything, you know? But then I have great teachers, great mentors who support me along the way and help me believe that that's possible.

And I think that's true, because I'm living the life right now, right? So I think being able to believe in yourself and meeting great people, taking a turn in the world is fine. And I think that is what make anyone can become scientists.

Andrew: Well thanks so much for coming on the show.

Jingxun Chen: Yeah, great.

Andrew: It's been great talking to you.

Jingxun Chen: Thank you. Andrew. It's Always nice to be able to share my story.