00:00 **Some kind of getting to know you, opening questions, and then I'm going to move in to ask you questions about collaboration, how you collaborate and collaborate with that kind of thing. And then towards the end, I'll talk about ask you about what would technology use to help you collaborate.**

OK.

And the overall goal of this project is to have a better understanding of collaboration in these type of projects in order to better support the technology. OK, so do you have any questions at any point?

00:31 You know? OK.

OK, so start off with you, your position is faculty, correct?

Yes. I'm also a director. OK, so I do take some notes just to like, OK, because it makes it easier for me to flip back and play because I have to transcribe everything that I will ask the director like a lab director.

Yeah.

00:58 So I'm the director of this core facility.

OK.

And I have a faculty appointment, but it's very it's a non tenure track faculty. So it's a different than if you were talking to a traditional family member.

OK, so what kind of research do you do?

So our primary research here. So all of my research is tied to the core facility and what we do is biological mass spectrometry.

OK.

01:24 And so it is a little bit unique because we are generating very large amounts of data, mostly in the context of protein analysis or metabolite analysis. So, for example, we do a lot of biomarker discovery type work, clinical studies, agricultural breeding studies, lots and basic science as well. But the common denominator to all of them is the technology, the analytical technology that we're using in the fact that we're generating lots of data.

01:54 **OK, OK, so just in general, I'm going to be asking some questions that may be a little repetitive or may seem like I'm asking something that's like obvious or implied is because I need you to say it so that I can.**

You have that. I have my data. Yes.

That's what's interesting is what you say, not what I'm inferring. OK, so what would you say? Like the goal of what your work is or what you do or the goals depending on the various projects.

Right.

02:23 So the goals of our projects. But that's a hard question. So our goal is basically to support whatever research people need. OK, so but. Very broadly, our goal is typically to determine biological molecules that are indicative of whatever the experimental design is.

02:57 So if they're trying to determine what's changing between, you know, a control population and a disease population, then our goal would be to use our analytical methods to determine which compounds or molecules are different.

OK, great. So you're the first person I've gotten a chance to talk to who does more of the analysis portion of these overall his overall projects, which is actually kind of exciting.

03:27 **So this question may sound a little bit weird, but on these very like you give me a couple of examples. What is the potential impact of the projects that you're working on, on like the broader impact, the broader impact?**

Yeah. So, again, the types of projects we work on are so broad. But some of them, you know, we have some projects that are looking for basically diagnostic biomarkers of a given disease.

03:56 And so the impact could be ultimately the development of a new diagnostic test. We have other projects that we're looking at, for example, understanding the mechanisms or the pathways that are involved in resistance to a biotic stress or an abiotic stress such as drought. So if we're looking at a crop and we can say these plants are very drought resistant and these are not, we can help these researchers understand why.

04:29 And then ultimately that information might be able to use to drive downstream breeding efforts or even genetic manipulation efforts. Think some of the research that we do in our lab specifically is focused on improving our ability to get to that answer.

04:53 OK, so improving the data analysis workflows, for example, so that we can take that data that we generated, generate and translate that to something that's biologically meaningful for good for the researchers.

OK, so now I'm going to kind of move into more of those like collaboration, asking questions about collaboration on average, how many researchers or technicians or people are on a project that you're working on?

05:26 **I'm going to ask you for an average and then like a range. Like a low of high. OK, so within my group or all the things that you personally have worked on, so not just in your group or what you've done here, but.**

Right. OK, so I might say on average, four to five.

OK.

And then like small groups or we worked on larger projects.

05:55 **Oh yeah.**
So, you know, a small project might be one person in my group working with them on one other person. So that would be two or two people in my group working together. And then, you know, larger projects. Definitely, probably, you know, 10 to 12 even.

OK, so are there any differences to do if you felt any differences in working with smaller groups versus larger groups as your research pros and cons, so to speak, on?

06:37 I mean, there certainly are differences, but I don't know if there's pros and cons to each to either. I mean, usually the size of the group is dictated by what the project needs. And the more the projects that are more interdisciplinary and that require, lots of areas of expertise tend to be bigger because that's what the project needs.

06:59 And the projects that are more focused tend to be kind of one person working with one person. So I don't know that there's a disadvantage or an advantage to either situation. I don't know that I would say that.

No, no, that's fine. OK, I just like I have a I have a list of points I try to like, you know, get the ideas right. So like sometimes it's like there's no like right or wrong or anything like that.

07:27 **So, OK, so some of that I'll be coming back to and I guess you kind of mentioned this a little bit and generally the role, your role that you're playing in these projects as you're doing the analysis portion. And what about the roles the other people and projects?**

I mean, it's going to. Right.

07:50 So within my group, we might have a project and then we'll you know, we'll have one person who's the project lead and then we'll have other people within the group that might be handling sample preparation and other person that might be handling the data acquisition and another person that might do the data analysis. And sometimes the same person is doing multiple tasks.

08:15 And then we usually have the collaborator who's whose research it is, and they are maybe the biologist who's driving, who's designing the experiment from the biology point of view than we typically help

them design, make that fit with a good analytical design and so on. And then so we will analyze the data and then we take it back to them to do the biological interpretation kind of a thing.

08:44 So and then on their end, there may there's usually a PI and then someone underneath. And that's doing the experimentation part in terms of whatever they're doing, collecting the samples or whatever.

So in the in the lead portion, when you're talking about in your own lab, where do you generally fall in these in these projects? What role are you.

I'm usually in the project management role. Yeah.

09:09 **OK, so I am about to ask you the same questions, but on, say, pick a current research project that doesn't really matter. Matter what the reason why I'm asking you this is because it helps the validity of my data to like, have people talk about specifics as opposed to generalizations.**

09:34 When we generalize, like inadvertently know details get fuzzy so often like a researcher or current research project.

Yeah. What is your role in the role of the other people's people in that project?

Right. So do you need a description of the actual project or.

I'm in my head. I need a little a little bit of a description would be good so I can put it into context.

10:02 OK, so we have a project that we've been working on with actually collaborators outside of the university. OK, and this particular project is looking at the basically trying to characterize molecular differences between three different commercial beverage products.

10:24 OK, and so my role on the project then is as the project lead for our group in terms of managing the project, managing the funding for the project and then managing that, you know, making sure that everything's happening as it should and that the communication between our group and the other group is happening, sort of coordinating that.

10:56 And then within my group, I have sort of someone who's managing on the next level the actual data acquisition, and then they have another person helping them with some of the hands on, OK, sample prep, running the instruments, collecting the data, and then the data goes back to that, to the manager, the lab manager, and then they work it up. And then we all work together to put together the final report presented to the collaborator.

11:29 **OK, and then I lost a little bit of. A little bit of. How many people are on that project in our group?**

There are three.

OK, and then so there's three in your group and outside of the group there are two to

OK. OK. So I'm kind of moving living a little a little bit away from that. You mentioned this.

11:55 **So what percentage would you say of your projects involve at least one collaborator who's at a different institution?**

Roughly 30 percent, 30 percent who got fast first discussion usually. Well, we have we do reports.

Oh, OK. Yeah.

<redacted>, like, you know, like really I'm just looking for like sometimes always. Never.

Yeah. But yeah. No that's great. OK, so why did you choose to work with those specific collaborators who are not at your institution.

12:28 Well that is I'm going to answer that question very differently than traditional faculty member because, you know, we are a service facility. And what that means is that we are essentially like a small business within the university. And so we need to support ourselves. And so the external collaborations are people who have come to us through various means and ask for our services.

13:00 **Right.**

Not we haven't gone to them to initiate a collaboration.

OK, great. So that's really good to hear somebody on the other side. I have interviewed a few people, a few people so far, and they're usually the ones that are looking for the expert.

So we actually are serving as the expert for these people outside of the university that are looking for your specific expertise.

13:24 So if they come to us typically and I mean, it may be difficult for you to speculate given your role there, how do people find you or if that's not, that's not difficult. I think a lot of people find us through our website.

OK.

And then as we've grown and established ourselves in this field, we get a lot of referrals and people finding us because we've worked with somebody else and then they've heard or they've read our papers and they find us that way, or they say, I've met them at an event where I've given a talk, for example, or at a conference.

14:02 And so we do we make an effort actually to do sort of external marketing, right?

Well, yeah.

To us to put ourselves out there. To these external potential users because they help support the facility. OK, so. And it also broadens our impact and gets us engaged in projects that we might not otherwise do if we were just focused on sees you.

14:32 And so then, you know, increases our expertise and lets us bring that knowledge back here.

OK, so you so are there any additional you just mentioned a bunch of benefits to working in these kind of distributed groups. Are there any additional benefits to working the district?

Yeah, sure. Yeah. To work with people who are external, well, they pay more. That's a big benefit for us.

15:00 But then also it also the more people we work with outside of the issue, it just, you know, it gets our name out there more. It increases our credibility. It exposes us to different things and different projects, again, that just build our repertoire of things that we can do and types of projects that we've worked on. And then it helps us support the facility and keep moving forward and staying current with technology and things like that.

15:30 **Are there any disadvantages or difficulties of working people who are off site?**

I mean, there's always difficulties in the sense that, you know, there's a value in sitting down with someone and talking face to face. And so we have collaborators, for example, we have some strong, very strong collaborators in <redacted> that we've been working with for, gosh, six or seven years now. And I would say for the first three years that we were working with them, we never met them.

16:01 We never we didn't know what they look like. We did everything via the phone and email correspondence and it worked very well. But, you know, then at some point we made an effort. They came to visit us, we went to visit them. And that has, I think, strengthened the collaboration, just having that personal connection and being able to know, you know, to talk to someone face to face and see what their world looks like and they see what our world looks like.

16:31 And I do think it strengthens the collaboration.

Have you ever tried using something like Skype or.

We have you know, I find it a little bit cumbersome. We haven't utilized it a lot for research collaborations, ways that I don't know. We just we just haven't we just haven't gotten there. We do a lot of phone conferences, but we have not taken that step to doing to doing Skype.

17:03 And maybe we should. But we haven't. And we do it when people ask us if they want to. But OK.

So on the flipside, when you're what about working with and see co-located projects or with groups that are at <redacted>, what are the other any advantages?

17:26 Well, just the flip side is that the advantage is that they're that, you know, we can set up meetings and have face to face meetings and that sometimes that can be advantageous and sometimes it can be not an advantage because then they're there right there and they maybe have higher expectations because they're right there. I don't know. But that typically isn't the case.

17:50 I mean, I do think it's an advantage, but I don't think that that the disadvantage is a huge detriment, like we've been able to very successfully navigate those situations. I think the only time it's that I would say it's been a big disadvantage is when we've been working with people where there's a language issue and I personally have a hard time.

18:20 I have a much if I'm talking to someone face to face, I have a better time understanding them than if they're on the phone. They just want to clarify. We need you because I like the word language is being used in different differently. And yes. So these would be, for example, <redacted> collaborators, OK?

Yeah.

Who are speaking English. But there's still this issue that they're difficult to understand, right?

Absolutely right.

18:48 And so much is conveyed over body language.

Exactly.

Exactly. So we have some collaborators in <redacted> and we have to schedules, phone conferences with them at very odd times because of the time difference. And so we have not done Skype with them. Everything's been in phone conference and I have a very hard time. I have to ask them to repeat themselves a lot. And I think we have actually had some miscommunications and so it's almost been better. Communicate with them via email right over the phone just because of that.

19:20 **OK, that's interesting. OK, so in then wait, say what percentage of your projects involve working with collaborators who are in very different fields? By that I mean something like that.**

All of them. Almost all of them. OK, yeah. Yeah. I mean that's kind of our purpose, right. Is that we're the right.

19:46 Analytical piece and most of the people that come to us come to us because they're not analytical people and you know, they don't. And so pretty much every project we work with is someone coming from a different field that not, you know, spectrometry, which is basically our field.

OK, so are there any difficulties in communication or.

Oh, all the time. Yeah. Yeah.

Tell me about it.

20:11 Well, just it's not a difficulty, but it's always a challenge for us to well to understand their project because there's so many different projects and they're all different. And so that's always a challenge. And then for us to figure out how to communicate our technology and our approach and the results to them in a way that they can process and get value out of.

20:37 So that is that it's a we spend a lot of time explaining the technology to people that are going to be using it.

Like what? What would you give? This is like an estimate of how well, per what would you guess what proportion of your project is just in communicating or we're trying to understand each other or portion of communication is trying to understand each other.

21:05 I would say in a given project, it's 10 to 20 percent of the time is spent communicating with them, either the initial them communicating their project needs and then us communicating back and forth like a team.

You worked on a project where you're collaborating with people in the same field?

Um, yeah.

21:34 Primarily we in the context of the I told you, you were working on sort of data analysis workflows. And so we do have some collaborators that we've worked with on those that are in our same field.

Are there any benefits or challenges to.

Well, there's certainly benefits to that because it's just another view and another person's perspective on a problem and coming to it. And they're adding their brainpower to the problem, basically.

22:05 And so there's definitely huge advantages about, I think.

Any disadvantages?

No, nothing.

Great. So that takes us through that portion of the interview. So I'm going to this is going to be a little bit different.

22:24 **Going to start off by asking you if you could describe or list of tasks like general tasks that you have to do when you're working on these projects to say split them up, go to things that you're doing within your group and things that you're doing with your collaborators that involve communicating or working with another researcher.**

Right.

22:54 So there's always an initial project, discussion, consultation that usually starts with an email exchange. And then usually we progress to either a phone conference if they're not local or face to face meeting to discuss their project. And then we usually follow up with a proposed project that also has some cost associated with it.

23:28 So because we're a fee for service type rate lab, we'll say this is how we propose to approach your problem, your experiment, and this is what it will cost for us to do it for you. OK, so there's that's a big step in our process. And then once that program is approved, there's more communication that. To coordinate the timing and how they're going to deliver their samples to us.

OK.

23:58 And when that's going to happen.

OK.

And making sure that we get all the data that we need about those samples so that we can do the experiment appropriately, you know, metadata that goes along with them. And then once those samples are in our group, then within our own group, there is some delegation of who is going to, you know, receive the samples, make sure that they get stored appropriately, and then who's going to process them and get them ready to analyze and then who's going to analyze them.

24:36 **And then when that analysis is done, who's going to process the data?**

And then when the analysis is done, who's someone has to generate a report. And then usually we send the report and then we go and then we have another consultation meeting to go over the results with the researcher. And that is, again, either by phone or face to face if they're local.

25:02 And then usually the researcher goes back and they digest it and then they usually come back or oftentimes they'll come back and have follow up questions that we'll handle. Sometimes they'll come back and ask us to do something different with the data so we might reanalyze the data and then that process starts over.

25:24 And then ultimately, if the if the experiment was successful, then they might decide to publish it, in which case then we usually are involved in that process at some level, depending on how engaged we were in the project. We might be co-authors on the paper, in which case we'll be very engaged in the manuscript preparation and sometimes we might have been only peripherally involved.

25:51 And so we might just be engaged in the sense of giving them a method section so that they can include the appropriate methods in the paper. And then sometimes that might be data that leads to a maybe elementary data that they're using for a proposal. And then we may be further engaged with them in terms of helping to write the proposal.

OK, so kind of take through this door.

26:21 **It looks and it looks really well. Plus, my handwriting is terrible. It's not going to be so bad because I think a lot of this is really repetitive.**

So when we're talking, you say you mentioned when you're initially consulting with your collaborators, you're starting off with an email exchange, then moving to a phone or face to face conversation. And so I have had a few questions. Where do you why do you start off with email to start with that one?

26:50 Well, because typically that's how people contact us, is they contact their they contact us via email. They say, I have this project. I'm interested in doing this. And so we'll usually ask them a few basic questions so we can get a general idea of what they want to do. And then we suggest that we talk about it either on the phone or have a conversation about it so we can more fully understand what their goals are, because oftentimes it changes once we have that conversation.

27:21 **OK, so that initial you have an initial kind of back and forth with email, usually you switch to phone. So why switch to phone?**

Well, because it's a lot easier to, you know, flesh it out when you're talking to someone in a in a live conversation. Sometimes the emails tend to get cumbersome. And often I mean, we just had an example of this where I was emailing with someone and he was describing what he thought he wanted to do.

27:52 And then I suggested a phone conference. We had a phone conversation yesterday. And by the end of the conversation, we had a really good plan in terms of what we how we wanted to approach the problem. But it was much different than what he had initially had in his email. And so sometimes it's just about under them understanding what the type of approach we might take and us better understanding what they're really trying to get at in figuring out the best way to get there.

28:21 OK, and that's something that's difficult to do.

Yeah. OK, so. OK, great. So when you're having these phone, these phone consultations, it's like we you one person with a representative there.

Oh no. Usually there's multiple people and people.

Are there any challenges or difficulties that arise from these kind of conference calls?

28:53 I mean, just sometimes. You know, people talk over each other and so, you know, you don't have the eye contact thing, but typically they work pretty well.

OK, so then when your group is coming up with a proposal, with information, because what tools do you use for use for that?

So we have a. A whole pricing structure.

29:24 **OK.**

And for the types of analysis that we do, OK. And so and we use it quick books, which is an accounting software. And so we have things in there. And so if we're coming up with a project and we determine, OK, there's going to be this many samples and it's going to take we're going to do this particular analysis, which takes 10 hours on the instrument, then we just go in and we know how much 10 hours of the instrument cost.

OK.

And that can help us come up with some cost estimate.

29:53 **OK, so sorry.**

That's OK. But I do think that that's unique to our type of laboratory and that individual laboratories have often have a harder time with that process because they don't have it all sort of worked out ahead of time. Budgeting, budgeting is a hard thing.

Yeah, it is.

So and this is multiple people working to come up with these come up with this proposal.

30:23 Well, so I have a business manager and she has developed all of these that she's gone through and done costing for all the different types of activities that we do.

OK.

And so she typically helps us, like we'll tell her this is the experiment we want to do. And then she will use these predetermined numbers and come up with an estimate for how much this project will cost. And then we'll work with her to fine tune that will generate a document and then we'll add the science to it and then we'll send it back to the collaborator.

30:56 **OK, so you're how are you communicating with her?**

So she actually is she's on my staff, but she works remotely. So she works. She lives in <redacted>. OK, and so we communicate via email and phone and then she's on campus once a month, but most of the time is via email and phone. Network like that works the challenges.

OK, yeah. I have to ask I have to ask that for every question.

31:25 **So you're going back and forth and you're generating a document.**

Yes.

He elaborate a little bit as you're writing something and sending it back to you or.

Well, so the software program, the accounting software program that we use has a template.

OK.

And so it generates an estimate based on this template. And so I should mention that at this point that we do use a software program called teamwork.

OK, OK.

Which is a project management.

31:56 **I want to hear a lot more about this.**

It's a project management platform. It's a Web based company. So you pay like a subscription and we pay somebody so much per month. It's not that expensive. But we started using it about a year and a half ago as we started getting you know, we have a lot of projects like 60, 70 going on at the same time. And so it becomes very difficult to keep track of all of them.

32:23 And so this is a way that we can so typically when we have that initial consultation, for example, we will go into team work and we'll start a project. And so we'll create a summary document in there with the notes from the meeting. And then if we create a project proposal, it will be attached to that project in teamwork. And then we'll communicate with our business manager about the cost.

32:52 And then she can upload the estimate in there. So it's all connected. And then when we do this delegation that I was talking to you about, like we have someone in my lab, but this technician might be in charge of sample prep. So she will be associated with that project. And then the idea is it doesn't always work, is that, you know, when she's completed that task, she will go into that project and say this task has been completed so that if someone else needs to do the data acquisition, they know that that's ready and they can do that.

33:26 And for me, as sort of the overall lab lead, it's a way for me to go in. And so if someone calls and says, you know, where's this project that, you know, can you tell me? And it's project thirty two out of sixty

five, I can go in and look it up and say, oh, it looks like the samples have been processed and they're in the queue for this or whatever.

33:53 So that's how we have attempted to manage all the different projects, which is admittedly at a much bigger scale than what you would typically find in a research lab. Although I, I do think that software like that project management software actually could be very valuable for the individual research lab in terms of just keeping. I know that even as a as a regular guys that I know how.

34:22 Hard time keeping track of all the different projects they might have, one student working on this project wants to work and it becomes difficult to keep track of what everybody's doing.

OK, so you mentioned that.

He said that would have a someone who was doing analysis and that they would put the results of their analysis up on to using teamwork.

Right.

34:50 And then you said that that doesn't always work so well because sometimes people forget to say, like, I'm done or whatever. But I think for the most part, it works that the other nice thing is that it can send you can have it send you reminders. So like, remember, you should update this person on the status of their project. So it'll ping you with an email reminder.

35:16 And then also our business manager can then go in and she can look at the project but and say, you know, is this project can I invoice this person for the cost of this project? Are you done? And so she can use it to kind of keep track of, you know, who she should be going after, basically to get to get money. So we continue to have our our cash flow.

Great.

And it and this is kind of along the same lines that you see that you're using it to attempt to manage all of these all these projects.

35:48 So what do you mean by that? Well, in the context of making sure that things don't fall through the cracks. OK, so it's really easy to you know, when you have that many projects you can't be thinking about all of them all the time. And so typically or in what started to happen is the people, the collaborators or the users or whoever that were the loudest and who called us every day asking where their data was tended to get the priority of our brainpower.

36:19 And so we would forget about someone who maybe was just patiently waiting and then but then that would usually come back to bite us. And so it was just easy to forget, not intentionally like, oh, I forgot to tell them that there were other projects that or I totally forgot I'm supposed to do this analysis for so-and-so. But this way everything's there and it's almost like a to do list. And so and then you can create actually your own to do list from which projects you're associated with in that.

36:50 So that's the intention, you know. So but it's a little bit. It's I think it's definitely working, but it's a little bit of changing people's habits to get used to using it.

And Jesus, for all of your data sharing.

OK, now, so we do it now. So all that is captured there is sort of the project like the project description, maybe the costing, what was done.

37:21 But then we have then but then the raw data is stored and the results are stored externally. Look where they stored. Well, we have we have right now we have our own servers that we manage and that are being stored is not it's most likely that's going to have to change.

Why?

Because we generate too much data.

Oh, no.

37:48 So, you know, so we're constantly upgrading that and probably eventually will go to some sort of cloud based storage system as that becomes more affordable.

OK, so why would you why switch to cloud?

Well, I think ultimately it'll be more it'll be more secure and more scalable and it should become more affordable because we just keep running out.

And how much data are you generating here?

38:19 I don't even know. Like, lots of terabytes, lots of tablets. OK, I can believe that. Yeah. So it works now. We do not have a system, so we don't have like a system that we can search and find things. So we just have a system, you know, a method of organizing by the name of the person who's project it is.

And when it was done, how does that work out?

It seems to work OK, actually.

38:48 So we haven't I don't know. I don't think that that's really been a huge limitation. OK, yet.

Yeah. Yeah, OK. OK, great.

So once you have here, you work together to create that proposal and costs and you're coordinating timing, communicating my metadata with your external collaborators again.

How are how are you doing that? What are you using?

That's usually via email, email.

39:17 And then sometimes we do have some collaborators where we have to give them a lot of data and then we usually do that by set up and FTP site and we'll do a transfer actually. And sometimes we do that when the data is too big for email, but. Not really. It's sort of in the middle area. We actually use we also have an account with the company. It used to be called YouSendIt. Now I think it's called high tail. It's basically like a document delivery company.

39:48 So we can post a file and then our collaborators can go and download it. And we have so much space and files are active for so long.

Right.

And then they disappear.

So it seems like you're using three separate tools for like based on like three tiers of data size.

Yes.

So, like, I mean, why is it so weird?

40:12 **Why would you want to use such things just over email, if you can, if not or phrase correctly on why, why, why users say why is this this additional middle software instead of using the server?**

Well, because the FTP is not really that user friendly.

OK.

Like you have to kind of go in and open your FTP server and then the other person has to do it and configure it.

40:42 And it's kind of clunky, whereas with the middle ground, when it's an email and they just get a link and it takes them to the site and they click download. OK, but that is still but that is more cumbersome. If I'm just sending someone an Excel file than just opening an attachment on their e-mail, you see if you were steps.

OK.

So when you are so you have all of this information and you're delegating tasks within your group, you mentioned that you're kind of taking the project management sort of role.

41:12 **But how is this how is this decision or delegation or communication portion being done with tools to use or how do you do it?**

Well, a lot of times that, you know, everybody in the lab sort of has their job.

Right.

And so a lot of it is whatever the project dictates, the project needs this type of work so that because the person who is doing that type of work to get delegated.

41:45 **Yeah.**

Or sometimes we discuss it in group meeting. OK, who's going to do what on a project and then OK as a group.

Right.

OK, but they're all because it's all of Face-To-Face communication for our group within our group.

Right.

For the group meetings. And just that's when you delegate.

Do you ever have like a one on one conversation to do that portion or.

Sometimes. Sometimes, yeah. So because we only have group meeting every other week.

42:12 And so sometimes the projects that come up we might say, but then it might be me talking with, you know, my associate director, I'm talking with me saying who should we have work on this project? And then we'll make the decision and just get it right.

Right. So is that like a face to face or email or either.

Depending there.

Depending on what?

Depending on if we're here. Sometimes I'm gone.

OK.

42:38 Or other people are gone at meetings or whatever or on a trip and then you do another consultation with your collaborators and to give them their results. And you mentioned that that was a phone call or face to face. Depending right, depending on their location.

Why that over email, if you're just giving results?

43:08 Well, because sometimes well, most of the time, I mean, I guess people we've been working for a long time, for a long time, they sometimes will just send them their data. And they've seen it enough times that they know how to interpret it. OK, but most of the time, especially with new, newer collaborators, and they need some additional sort of walking through. They need to walk through someone to walk through the data with them.

OK.

And so that's why we do that. And it's easier to to yeah.

43:37 To do it rather than over email.

OK. OK, so I'm going to be jumping down to OK so I'm going to have only a couple more questions for you. So we are working with your collaborators to write a proposal or co-authored a paper. What kind of paper. What tools to use to like write and just, you know?

Just email.

44:07 **OK, so are you are you emailing like one person or multiple people and a lot of times multiple people at the same time?**

Yeah, OK. So ah it's like they're like a document being passed around.

OK, what, what is, what do you use to edit for word. OK and how, how are people like communicating their comments to use track changes.

Track changes.

OK.

44:38 **So are there any, any challenges with that process.**

Well the only challenge for that process is when two people are editing at the same time and then you have to reconcile. They're not doing it on the same document.

Yeah, that seems to be a universal problem.

Yeah. So it works best when one person starts and then they send the document and then another person makes their edits on top of that person.

45:06 And so you end up with a document that you know or you. So typically what I'll do is I'll send it to there's usually multiple levels of co-authors, for example. And so there's the person who's primarily working on it and then the next closest person. And so I'll start sort of iteratively going down and I'll work through most of the bugs and then I'll send it to this person and then I'll make, you know, incorporate all of their edits and then I'll set a new clean version to someone else.

45:36 And so I usually do it that way, but that's only when it's my paper. Other people don't necessarily do it that way. And then it's a little bit harder, but then it's up to them to reconcile it when I'm doing it. That's my approach. I send it to one author at a time because I don't like to have to get multiple comments from multiple people, but that is difficult. I do that too.

OK, so if you could create a hypothetical future technology that would help you collaborate or be collaborating easier, what would it be or what kind of features would it have?

46:22 I mean, I do think it would. Be nice, and I know that these are the kind of exists already, but they're just cumbersome enough that I don't use them a lot, like things like Dropbox and things like that just because not everybody's.

46:47 It's not it's not that universal yet.

OK.

But I think ultimately it would be some sort of portal, I guess, where there was kind of unlimited storage and then you could just all be working off. You know, it could be a place where you would just say, oh, I put this here, I put that there. And it would be easier to initiate than I don't know, I find Dropbox a little bit hard to use and I don't know why, but.

47:23 Yeah, I don't know.

Oh, that's fine.

I mean, I think I think, you know, we do. Email is taking collaboration to a whole new level, and that is awesome, you know. I don't really know how people did science before we had email.

47:48 **I wouldn't know at all, actually.**

So, you know, I think if you and again, my perspective is a little bit different, I think if I had a you know, I know a five year research project with the same group of people, that was a big collaborative long term thing that having some sort of portal where all the correspondence about that project was captured.

48:18 All of the documents about that project were shared that would send me notifications, you know, if something new was done, for example, that could maybe facilitate, uh, meetings, you know, maybe there would be a. This Skype like aspect to it that could facilitate meetings via webcam if you were not co-located.

48:50 I think that could make just make things easier in terms of keeping everything together.

OK.

But a lot of our projects are shorter duration and so something more like the teamwork where it's more of a project management. Works quite well.

OK. OK, great.

49:16 **And my I guess I like to have one more question for you now, just out of curiosity, how often do you use? Have you tried to use.**

Not a whole lot like we. Not a whole lot, and I think maybe a lot of that, too, is that it's kind of cumbersome to set up and so it doesn't seem worth it for some of these shorter term projects. If we had a lot of these a lot of longer term projects and maybe we would.

49:43 And within our own group, you know, all of our computers are networked together. So, you know, all of the data and everything is stored on central computers so any of us can get to it. So we already do that sort of internally, I guess, but for external projects there, never long term. And so it doesn't seem to make sense. So internally, I guess we already kind of do that.

Three, what are you using?

50:11 Is it just we just map our drawers and we all can see, you know, we set the permissions so that we can all map to them. And then we also do we use team viewer a lot, which is a like a remote desktop connection type of software. So like we use that to to analyze data, but also to control the instruments from remote locations. So it's basically a way you can log in to the to the computer remotely.