

00:00 **OK, so I'm going to start off with some getting to know your questions and then ask you about collaboration and then move into technology use for collaboration.**

OK.

OK, so start off with what type of research, what kind of research to do?

That's a pretty broad question. Yeah, I do research that includes the quality and safety of work.

00:30 OK, of course our big effort right now is in microbial resistance in that area.

Right.

That's not our only route, but that was a big effort. We do I do a lot of work personally to address the trade barrier issues for exports.

OK.

And then we do a lot of work on improving demand for meat and agricultural products, mostly meat, but also some other products.

01:04 So that's the primary areas of research.

OK, so what is the goal of your work on those lots of goals?

Most of it is associated with improving public safety, associated with consumption of meat and food products, or the third demand and satisfaction with those products.

01:29 But as I said, we also work quite frequently for the government and others to address trade barriers that are preventing our products from being exported. So they're a business issue. We try to assist the industry, but we also try to assist society by making the product safe and improving confidence in the food supply.

01:58 We in some cases, we just are doing science for the sake of science. So we just want to know more about something that's probably more rare.

OK, so on your, say, a current research project about how many collaborators or researchers are involved?

Well, I have several projects like the one you're familiar with, the <redacted> on that project.

02:27 We have a ton of people involved. Most of them are on campus. OK, so like <redacted>'s involved, <redacted>'s involved people in clinical sciences and the vet school math people and infectious diseases. We have people from <redacted>, several people from this department, animal sciences. And then we have collaborator collaborators and other institutions.

02:57 We have a lot of industry collaborators, including those that funded the project. We work with <redacted> and shoots some. We are working with veterinarians and food safety personnel and other universities, and we're also working with scientists that work for <redacted>.

Right.

03:26 **So a lot of people.**

Yes, there is.

Can you give me a ballpark number?

Just actual scientists; I probably don't have the full count.

03:56 I'm going to say at least 20.

OK, and some of my questions are going to get redundant or are there going to be stuff that I already know about you, but I have to hear it for the study because the data is better if you say it.

So what is your what is your role in this project and that project?

I'm a I'm a co project leader. There's two of us that work around, so that's our role.

04:28 **OK, so in general, what is the average number of researchers on the projects like his now and historically that you've worked on?**

Oh, it ranges anywhere from two to this might be the biggest the biggest number of collaborators that I've worked with. And there's actually more people than what I've listed. So I'm talking about just the people that are intimately contributing to the project.

04:58 And there's a whole lot of peripheral people that are involved also that they may not be directly helping to conduct study, but you're involved in one form or fashion or another. It's anywhere from two to 25 or 30 ? Yeah. And, you know, a lot of the projects I do. I mean, I do projects anywhere from eight thousand dollars to two and a half million dollars. So there's a lot of variation in the scope and size of some of the projects that work on.

05:30 Some of them were completed for the industries. I mean, specific companies. Some of them are completed for trade organizations that represent the industry. Some of their them are conducted using a levy that the industry assigns on itself to fund research. Some of them are funded by the federal government. Some of them are funded by other countries.

05:57 So it's hugely valuable for sure.

So kind of like in general, what is what is your role in research. I'm asking you so that I can put the remainder of your answers in context, because I've talked to people who are doing very different things.

06:24 So I don't know if this is specifically answering your question, but as scientists become older and become more senior in terms of what they do, their responsibilities sort of change. I don't know if that's a natural evolutionary thing or not, but that's where it's been for me.

06:47 And so we're at one time, you know, I was active actually doing the work in the laboratory and doing the analysis on the computer and, you know, running SACE and running all the statistical packages and, you know, having a fleet of graduate students and you're, you know, showing them how to do things. It's all changed over time. And, you know, that's sort of where you start out.

07:10 And then as you go from assistant professor to an associate professor to professor to beyond, then I probably do more today. So this happened over a long period of more of my responsibilities today are about managing research than they are actually doing your research. So I helped design the studies and write the proposals and get the money. And then I help guide graduate students through conducting them.

07:40 But a lot of the feet on the ground, in the field, in the laboratory work is a delegate. And it's not because I necessarily want to. It's just the nature of the beast that you don't have so many hours in the day. And so if my role is to make sure all the pieces of the puzzle fit together and we get the whole picture done, then somebody is also going to be doing the actual work.

08:06 So we have we have a hierarchy of individuals and a big project like this USDA project that sort of fit different levels of the spectrum where you have the people actually doing all the work, which is usually graduate students and postdocs and laboratory technicians and all the way up to the people managing the project. And then, you know, even beyond me, I have my own bosses to me. And so we have a management.

08:35 We have management like the big <redacted> project. We have a management group. They're not called management. They're called the advisory committee. So we have a group of people that manages it. And then we have collectively a committee that's comprised of all the investigators that also helps make those kinds of decisions and guidance direction and that sort of thing. Our job is to implement those to some extent.

- 09:04 I'm talking to people, I mean, speaking to technicians and speaking to people who work in various different places on that hierarchy. And it affects how you answer questions. Maybe not great, but different. They're different. Everybody is important.
- Oh yeah. No, no. For sure. For sure. I just mean like that. And in fact, the people doing the work are way more important. I just mean like to do the daily tasks. Right. They're going to be different and that affects the way**
- 09:34 **way you do things and then like what tool to use in your challenges, your specific role versus challenges to somebody who's doing or the groundwork or whatever.**
- Anyway, so are there any challenges or disadvantages to working on projects where you have a smaller number of collaborators?**
- So disadvantages when you have small numbers of collaborators.
- 10:05 Yeah, you can't answer questions, you can't address hypotheses that are as wide in scope. So we flip it around. The advantage to having a big team like we have in our <redacted> studies is that everybody in that team is contributing very different pieces of expertise. So <redacted> is a analytical with bioinformatics, you know, big data person.
- 10:38 I don't know the first thing about that. You know, I understand the biology of antimicrobial resistance. And so when you take people with those differing levels of expertise and you put them together in the scope and the magnitude of the question that you can answer becomes much greater when you're dealing with complex societal issues. That's what you've got to have. If I'm doing a study where I'm just trying to validate the effectiveness of an intervention system, the packing plant somewhere, you know, myself and maybe one other faculty member and a graduate student can do that.
- 11:13 And so we have more control over where we can do things more quickly. I know this isn't the question.
- No, those are the next three questions. So it's good.**
- So but you can't. But the big drawback is you can't answer questions of magnitude that require different areas of expertise. So that's the main problem. And our group.
- 11:47 But you probably have questions about this.
- No, you can no, you can talk now. It's there's no real order to this.**
- So in our group, I mean, we're truly collaborators. And I'm going to define that for you. Everybody in our team is on our team. And this is true really for most of the teams I work on.
- 12:12 Everybody in our team is a truly important component of the team. Without them, we can't answer the question. And given that our philosophy, when we manage that it takes a team approach, is that we will not accept anybody as a part of our team if they are self-serving and if they are only out for themselves.
- 12:47 We want people to collaborate with us that are in it for the benefit of the team and the outcome, not for the benefit of their own personal gains. And if they are, they want to survive with us. And I'm straight up honest with you. A lot of people will say that our team truly functions that way. And, you know, we've elected to not partner with some people because they don't conform to that ideal.
- 13:19 And we will continue to perform to that idea. And in fact, we're even in the process of developing strategic plans to ensure that we continue to conform to that ideal and. That's not necessary in a small group, a small problem, small hypotheses, but it's one of the drawbacks to doing big studies with lots of collaborators. And if you don't if you don't have that sort of system, then

- 13:54 There's a lot of stabbing in the back and throwing under the bus and things among team members and collaboration. We're not going to do that. So that's addressing both small and large corporations.
- Have you ever had a project fail because of collaboration issues?**
- Yes.
- What happened?**
- 14:17 One that comes to mind as we were working with some and scientists that worked for the government, the federal government, and they were self-interested. And as a consequence, they we were evaluating collectively several technologies that were in the process of development for commercialization and use widespread worldwide in the industry. And they essentially threw us under the bus because they were out for themselves.
- 14:48 **What was the ultimate outcome of that project?**
- Negative, peer reviewed scientific publication. We didn't even have the opportunity to edit.
- Oh, wow. So that's. That's definitely a poor outcome.**
- Yes, so kind of.
- 15:13 So if it's self serving of collaborators, in my historical experience, I don't know much that. You know, everybody needs to have a common goal, that they're all after you working for the bigger picture. And if they're not, it's OK.
- So about what percentage of your projects have involved at least one collaborator who's at another institution? How much of them involved?**
- 15:42 Yeah, a lot, 60, 70 percent of the work we do.
- OK, how many roughly have involved other projects where you had collaborators at multiple different institutions?**
- Almost everything we do. OK, again, 70 percent maybe.
- So in these situations where you're working with collaborators who are elsewhere, why are you choosing to work with them?**
- 16:15 For the reasons that I've stated, they all bring different pieces of the puzzle to the picture. So if you have this overarching hypothesis and objective that you're trying to answer questions about, you have to have the people with the expertise to help construct the study that addresses those big, bigger objectives. And what you'll find in science as time goes on is in the days of <redacted>, one scientist could answer big questions.
- 16:43 Today, questions are so complex that that can't happen. There's no one scientist that can answer most of the questions that are big problems facing society. And so you must have teams of people working together that offer different components of expertise in their aggregate to help solve the problem.
- That makes sense. Yeah, no, absolutely does. And again, that's kind of also like a little bit of why I'm doing what I'm doing.**
- Right.
- 17:13 **So are there any disadvantages or challenges associated with working on projects where your collaborators are distributed at different locations today?**
- Not so much. We were, of course, were more selective now in the collaborators we choose to work with <redacted>, I've already told you, right?
- Absolutely.**
- And so given that up front as a qualification, we don't have any problems. This great one.

- 17:40 If I were to pick one thing that we have experienced, perhaps in other studies, it's the lack of some of our partner institutions doing things on time. I think one of the reasons we're successful in obtaining research funding as we get things done on time for a company comes to us and they need an answer next week. We get it done next week. We don't take on the project and then say, sorry, we can't get it done for next month. We do it now.
- 18:11 And that is like that's like the first command in our program. And so we have the same expectation when we're collaborating with others and sometimes that doesn't happen. OK, that would be the only thing that we've probably run into.
- So I like I said, this is going to get really redundant, but I'm doing it kind of like mine answers.**
- 18:41 **So what about what are the benefits to working on projects where specifically your collaborators are at different institutions?**
- Similar institutions have the category and another angle, like for example, working with the <redacted> in <redacted>. They have high sequencing systems that we don't have at <redacted>, so we need to partner with them, just have access to the technology.
- 19:08 We work with another scientist there that's bioinformatics collaborator, and he brings something to the table in our group that we don't have on campus anywhere, at least currently. And so he helped that. We work with people that we need to get them and sometimes they're on campus and sometimes they're not. And sometimes the need is equipment or expertise and methodologies or something like that.
- 19:38 And so we frequently go to other institutions or things like that. In other studies, quite frequently. It's just the magnitude of the study. We need help to get the thing done. And so we work with other institutions just so we have enough aggregate labor to work. So it varies a little bit. And all of those cases people are also contributing your facility, your base of expertise or something to the government as a whole.
- 20:11 OK, as long as they get it done on time. We're going to cut you off.
- So are there any disadvantages to working on projects where everybody's at the same institution?**
- It's nice when everybody can get together for a quick impromptu meeting if you need to. So that's a nice convenience. But with technology nowadays, I mean, you're pretty much in constant communication with your collaborators, so it's not that big of a deal.
- 20:40 **OK, so moving on to about what percentage of your projects involve collaborators who are in different fields from you?**
- 30, 40 percent.
- OK. These questions are like the same as you probably guessed, I'm going to say, are there any disadvantages or challenges to working on projects where your collaborators have a different field or have different backgrounds?**
- 21:11 I don't know if there's challenges... if you select the right collaborators, then there's never challenges. There is, but there is sometimes differences in vernacular and language and technical language that's used to discuss things. And so you have to have constant communication so that everybody understands things that are written, things that are said to mean the same thing.
- 21:41 So, for example, computer sciences and bioinformatics experts use a language that I had to learn. And so there's that. But I don't think that's a challenge. I actually think that's an opportunity because it causes the group as a whole to become more knowledgeable collectively. So but you have to do it.
- And are there any additional benefits to working with people who have different backgrounds?**

- 22:10 Yeah, yeah. I think it's just funner. You know, I've been trained by a certain culture, by a certain group of people that have certain backgrounds and it's fun to work with others that have different backgrounds, different training, different skills that think about things differently. So it's fun. It's great.
- So and then kind of on the flipside, are there any disadvantages or challenges to working on projects with when all of your collaborators are in the same field as you?**
- 22:45 Oh, well, the challenge is you can't answer a broad question.
- OK.**
- Well, that's pretty much it. I mean, you don't have any problems communicating that sort of thing there, so it's not a matter of it's just a matter of the complexity of questions.
- 23:08 You can answer more narrowly.
- And then and then are there benefits to working on a project where everybody's in the same field as you?**
- Yeah, the obvious one as you all speak the same language. So you're not miscommunicate in that period. That's probably the biggest one.
- 23:37 Everybody has an innate understanding of the issue if there's people working on the problem that come from different knowledge bases. So, for example, I know the livestock industry, but not everybody on our team does. I mean, I know well, that's what I bring to the table. Perhaps not everybody in our team knows that.
- 24:01 And so I have to do a better job in communicating biological significance of a given issue in the issue itself so that the rest of the team comprehends. Why do you think or do certain things? And a smaller group with the same affinity for technical skills have that issue.
- 24:27 **OK, so you mentioned that especially when you're working on projects with people who are in different disciplines, that you're in constant communication, you have to be careful about. How often do you meet with your collaborators?**
- I meet every week. Every week. This frequency change due to the location of your collaborators or the size of your group or the backgrounds of people that you're working with.
- OK. Yes, it does.**
- 24:55 I mean, if you have if you don't have such a huge group, then. And they're all speaking the same language, then maybe you don't meet so frequently. OK, but on big projects like this project we're working on, you have to meet. We take holiday weeks or things like that, but generally speaking, we meet every week, so.
- What do you think has the biggest impact on the outcome of a project— the size of the group, the location of your collaborators or the various backgrounds that they have?**
- 25:33 Definitely. Some of these questions are they're coming from. Are some previous work results from previous work and we're wondering if it's still relevant. Basically ten years since it's been like ten years since the studies were done. So as we've been talking, you've mentioned a few.
- 26:00 Tasks or roles or activities that you do that involve working with your collaborators, you've mentioned writing grants, managing projects and communicating with the people in your group.
- Are there any additional tasks or roles that you do that involve working with collaborators?**
- A lot of administration. OK, so it's fitting the right personnel together to work on pieces of a project.
- 26:29 Working and communicating with the group as a whole to decide on direction for various pieces of work. I mean, it's by default when you have a lot of collaborators, mostly, you're answering more complicated questions and so you have different people working on different pieces of that

question. And it just takes some administration to. Now, I don't know if we're good at it, but that's where. Mean, that takes a lot of time.

- 27:00 So particularly when you're dealing with big brands and big projects and several of the. We're continuing to get more ground. Somebody just has to look at things from like the 40 thousand foot. Just right for sure. Right about so we talked a bit about grant writing. About, say, writing papers. Here you will find some philosophical differences.
- 27:31 OK, in our program. The graduate students in charge of projects always have the opportunity to be first author on their work. Always we never displace a student that did that took on the accountability and the hard work. And authorship is so. You know, I'm usually either the last author on the paper or somewhere in the middle, because nowadays other than editing.
- 28:02 And helping students construct logic on their manuscripts very rarely in my writing, the first actually constructing the original paper sometimes, but not very often anymore. And so our publication policy is that we try to divide it up equitably and a huge team environment. We have lots of people working on a project. They all have to show productivity, including developed theses and dissertations and things like that.
- 28:34 And so we try to divide it up to the extent that they get the work, they get to write about what they worked on. Sometimes a study generates more than one paper, and so you have more than one person writing papers on that study. They're always the first authors, and then we try to be equitable and fair and generous in allocating our partnership. In our group, we try to be very good about allocation of credit.
- 29:06 You know, I'm an old guy, and it really doesn't matter whether I publish it on the paper or not. So it's more important to me that my students and my collaborators need to publish papers, particularly young faculty. Because it's not going to help me out. So. Our authorship, you won't find that to be the case if you ask other groups.
- OK, if that's the case and I believe that most of our group has similar feelings, I think that's definitely how it works in my lab as well.
- 29:38 Even though we're very we're still very small. We're trying to support young faculty and students are looking for a future career and. That's my first and foremost interest. A big component of what we do is, is not just the research, it's also the graduate education tied to the research. And in many cases, that's actually a greater priority to me than the actual research itself. And so it's important to me.
- 30:07 That we identify and address authorship issues up front and that we stick to that. If somebody else drops the ball and they don't publish their own stuff, everything's fair game from that point. OK, but everybody has the opportunity. And our program to publish original research based on work that the. It's great.
- 30:31 **OK, and then this may this may sound silly, giving that the kind of roles that you're currently fulfilling, but how frequently do you share data with your collaborators or within your group?**
- All the time and nowadays with the steps that he's like we're conducting. Many of right now, you fairly you have you're required to share that and make it public. OK, so you can publish.
- 31:00 **Have you ever had any concerns with regards to trust? And can you elaborate a little bit more?**
- Because people can take raw data and they can make them say a lot of different things than what they were designed to answer questions about. And that is always a concern because there's a lot of people that are pseudo scientists out there. For example, this week there was a story published by Consumer Reports. About a food safety study that they conducted on three hundred samples that they purchased from grocery stores and ground beef.
- 31:32 And it's misleading completely and make conclusions that aren't even tied to the data or the design of the study that they. And that's inappropriate. Right. I mean, the scientific method. You

ask a question, you design study the answer to a question, you do the study, analyze the results, and then you objectively answer the question. That's not what they've done. And so we want to train scientists. Firstly, they can apply to the scientific method.

- 32:01 And my expectation is that others that have access to our data would do the same. And I got to tell you, I would be the first to be critical of someone who uses our from. OK. I'm a I'm a stickler about that. What are you, some scientist? Yeah, well, no, and it's especially important with food safety or things that are affecting the welfare of the public. Yeah, absolutely. So I believe that's something that's just true.
- 32:29 It wouldn't matter to me what discipline you're in if you're a scientist. I mean, by de facto, you must also tell the truth. Right. So, I mean, you can't separate the two, right? A lawyer is a different game, but you can't if you're a scientist. I mean, you've got to live by that. And so if somebody. So my concern about releasing and making data raw data public is exactly that, that it can be misused easily, OK.
- 32:59 **When you're sharing data with within your group or with with collaborators, what kind of tools or what techniques use? How do you how do you share your data with the people that you're working with?**
- Depends on the study. OK. I mean. Usually it's raw data, so it's an Excel file or it's a database file or something as the big data. Concept is growing. I mean, as you know, we have our own servers.
- 33:28 And so in cases, we will never provide people with access to our servers unless it's a protected access. OK, but I'm aware of. So if there's a security issue, then I'm sure you're OK, but the hard drive and so on. There's a lot about the handling of big data that I'm probably not the one to ask. We have other experts in the area.
- 33:58 Like <redacted>. But, yeah. But. But the answer to the question is it varies depending on the context.
- OK, so if you're, say, sharing those Excel files or database files, how are you giving that transferring that information to a collaborator, if it's not a sensitive file?**
- You know, we'll just email it to some.
- 34:25 OK, sometimes if it's more sensitive again, sometimes or does. If it's very, very sensitive, we may selectively only give them portions. So it just depends on the degree of security that's required to protect either density of companies or people that contributed to the data, or is there some reason that needs to be secure, more secure than we get?
- 34:57 **So we've discussed quite a bit about why you choose to use physical media, thumb drive, hard drive to chase raw data. Have you had any problems or issues come up when using that method?**
- No small studies with big data, there's clearly issues, but we're still working around. OK. Big data stuff is difficult because you can't just transmit it over the internet.
- 35:26 So I think we're still learning about that. With small study. I mean, we're able to.
- OK, can you elaborate a little bit more on the issues with these, with transferring big data files?**
- Big data files are just so huge. There's just so many bits of information in, even with the Internet systems. I'm not computer science, so I can't tell you what the terms are.
- 35:56 The terabyte system, even then, we can't transmit data. Quickly or efficiently from server to server. So, for example, if the of <redacted> does sequencing for us, we need to pull the sequencing. That can be a lengthy process.
- Mm hmm.**
- More importantly, if you're using somebody else's bioinformatics or analytical software to evaluate big data.

36:27 This can literally run for hours.

Oh, yeah, I know.

So as you know, and so that's the things we're learning about and there's still room for technology.

Right, for sure.

Actually, I have a friend that he's he works for Intel and he's in charge of the big server. State of the art server development for the big server farms.

36:51 He's sort of in a class by himself because he's not developing servers for you and he's developing servers for Amazon and things like that, and so he talks about how it's for the foreseeable future. It's going to be a continuing.

Yeah, for sure.

And that's about the extent of my knowledge of this fight.

37:18 **OK, so when you you're using email to send files to your collaborators, you mentioned that, you know, there's a difference. They use different methods based on the sensitivity or security is required for the specific document. So, like moving that aside, when would you choose to use to send something over email versus, say, putting it on the server and so forth?**

Well, it may already be on the server.

37:44 It's usually going to be a smaller database, it's usually going to be associated with a design, a controlled study could be perhaps an epidemiological type study. We have gathered information from a public source. But there are files that you can transmit with the 10 megabyte or 15 or 20 megabyte capabilities. OK, beyond that, you're going to have quite access to it.

38:11 **OK, so I mean. If it's if this data is already on the server, what is the benefit of sending it again using email here?**

OK. We're not trusting. Yeah, I am picking up on that. Not in a bad way, just like it's of the nature reserve. You know what, you have to protect our storage systems, right?

Right. For sure.

38:40 **OK, so many of the companies, have you ever had any issues come up when using email to transfer data?**

Yeah, of course, I mean, know things that didn't sound. Corrupted files or whatever, I don't know. Again, we would not do that if it were sensitive data.

Right, right.

39:06 So I'm not worried about somebody hugging it, right, right, misusing it because it's not sensitive, so those things may have happened and I don't know about them. Mostly, it's going to be just transmission issues.

OK, and then what about using the server to transfer files? We've discussed the big data issue and transferring from server to server and we've discussed the security issues.

39:36 **But you also mentioned something about being able to provide access to the server.**

Yeah. So, like several of our collaborators worked for, other governments I didn't mention earlier, is the <redacted> government right or <redacted> governments is a little picky about who they allowed to have access to their information. Well, they're collaborating with us and they're developing data that's being used in our study. And so it's very difficult for us to have access to it. So I'm sort of going at this from the worker's perspective.

40:06 Right. And I mean, they just will not. It's federal <redacted> policy that they're not going to give us access to their servers. And so we have to figure out. And on our side of it, we may be more

willing to provide access, but even then there's requirements. When we when we pass in Nairobi, we have to meet. Regulatory requirements for privacy of data and things like that, and so we must, by federal law, protect that information.

40:41 And so there's security issues there, so. Not being a computer science person, there's probably mechanisms that allow access to server data that you can control and that allow you to still maintain protection of sensitive data on the same server. But I don't know what those systems are. OK? I'm not I'm not against allowing access no server to obtain data, but I am against allowing access to sensitive information.

41:15 **Right, right.**

And I am not allowing corruption.

Right.

And as somebody who is frequently gathering personal information, I understand that concern. But we don't want or we don't want a two million dollar study to be jeopardized because of corruption. OK, so. It's protection from several. Bad things, right?

41:42 **Right. OK, so and when you're carrying out your administrative management tasks, you're communicating with the people within your group or in your that you're collaborating with. What methods or tools to use?**

Face to face with email a lot. We've used Skype and other. Electronic media platforms.

42:11 We travel a lot, I guess, when you're face to face category. Telephone. Texting. Yeah, I mean, pretty much every mode of communication that exists. And so you start with texting, because that's something that's only come up with a couple of my participants are very curious when or why do you use texting like I'm assuming it seems like cell phone texting versus an email with the benefit.

42:49 Just the speed of light. Yeah.

Are there are any drawbacks?

Well, I'm sure that. In this day and age, clearly it's probably not private, but. I would never think that I would be in a position where I have to worry too much about. But it's fast that allows you to have private conversations quickly.

43:17 It's just a convenience issue. I guess there's not a huge difference between an email. What's the advantage of email then I will say this about texting, OK, like if you if you're communicating with people that are in other countries, it's much cheaper. Yeah, because if you don't have Internet access, that's expensive in another country. Texting you can use. OK.

43:45 **There's definitely something to think about, it hasn't come up before. So thank you for that for sure. So, OK, and then when would you say, email over other methods of communication when the communication is more lengthy?**

Perhaps requires a record. Perhaps. Direction. Procedure.

44:16 OK, um, so, um, versus say the same for communication, right? Right, I'm kind of I'm asking you about advantage probably used interchangeably. Yeah, what about, say, compared to face to face meetings, face to face meetings? I like to minimize too many of them. OK, but. I mean, certain there's certain circumstances where you just got to have them like, oh, we could love me.

44:47 I mean, there's no way to understand. Let me rephrase this. It's much more difficult to fully understand. With the jargon and the technical jargon and the different things that differing expertise is bring to the party. You've got to be able to ask questions and have a dialogue about that, and that's difficult to do with electronic communication, you can do it with like Skype or something like that.

45:17 **Even though it's difficult, so, um, so it's I mean, have you had issues with Skype?**
 Yeah. Dropping. That clarity. I have huge issues with. If there's something that is a critical discussion.

45:41 Revolves around both parties or multiple parties understanding something clearly when there's differing knowledge basis. Dealing with the topic. A face to face meeting is almost always going to be favorable.
OK. And what about given current technologies?
 Yeah, OK.
What about using the telephone? What are the advantages or disadvantages to using the telephone?

46:17 I don't know, I mean. I could spend 20 hours a day on the phone. You can't control conversations, you can't. So that's the disadvantage. I mean, they're fast. I mean, clearly. If you just need a quick answer on something, it's a graduate student, need some direction on something or an opinion.

46:41 Then it's obvious communication of choice, but. If it's something that requires guiding the conversation, staying on track and staying on topic and. And some conversations tend to get off track.
Is there like any time where you're using one method of communication over another, four different people, different collaborators?

47:13 You know, you have somebody that you would only call or never try to Skype with or know some of these depending on.
OK, so if you could create a hypothetical future technology and you don't have to limit this to what we can do or what you think that we can or can't do or will be to do, that would make collaboration easier for you when you're doing your research. What would it do?

47:42 **What kind of features would it have?**
 We're just doing the systems. Big data gathering and analysis. OK, that's very cool. Yeah, we I don't think we're going to be able to proceed too far down the route we're taking without that type of system being evolving and being available. Right. So I'm pretty interested in it. I don't know the first thing about it, but. Yeah, I mean, the capabilities it offers.

48:11 Yeah, that's I mean, this is this is part of why this is we're hoping to incorporate. Support for collaboration into a status. So, I mean, because I'm on that sub project of the project, OK? It's a no brainer. It's worth.
Right. That's pretty cool stuff.
 Yeah, excited about it. That's great.

48:38 **So I do have a couple of last, like, wrap up questions for you. What is your current position?**
 Professor.
OK, and then I have I have a question, this is for my demographics, I'm required to report this. How old are you?
 <redacted>

So do you have any questions for me?
 So, OK, you have to work it out for sure. So you told me to do this for you. Yeah, I mean, yeah, we've got to I know he's working on it right now with he's currently working with a student who is working on giving progress, kind of a progress update, slash time estimate when doing those running those bioinformatics tools, because currently, you know, idea when they're going to end.

- 50:17 So people who are who are doing that kind of analysis have to physically, manually check things done. So I know that's happening right now. The thing that's evolving, I think, fits in that same dimension. I think I know I know the first thing about it, but, you know, like all these devices being able to communicate with each other, that's important without by themselves. You know, that's important also. But. But with security. Right.
- 50:47 Right, that's Social Security is always a big issue, I think. So I can foresee a day when we can initiate a bioinformatics pipeline analysis with a cell phone and some server or some cloud based system. And then tell me I'm on my computer over here when the things complete. I mean, and I'm probably not even thinking as widely and broadly as others are, but know that would definitely be great for sure.
- 51:19 So it would be cool. Yeah.