

Intro to Research - March 5, 2024 (Transcript)

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0:45 Welcome to Intro to Research

Brittany

Hello, everyone. Oh, can't hear me. Just told us. Hello, everyone. Welcome to intro to research. Please sign in if you haven't already and use the QR code. So just to introduce myself really quick, my name is Brittany, and I am the undergrad research TA. I am a PhD candidate here in chemistry, and I also did undergrad research a while ago. So, you know, the office of, chemistry undergraduate research is here to help you find a research opportunity on campus and really make the most of it. And so, we are located in the chemistry north tower. So that's in room 7408. And you can also, like, check us out on our website.

And, so today, we're gonna be talking about what, what you need to know in order to, get into a research group, how to find 1, how to get into 1, and how to make the most of it. Alright. So undergraduate research or research in general is an inquiry or investigation, that makes an original intellectual or creative contribution to your discipline, and this is from the Council of Undergraduate Research. Okay.

So some of you might be wondering why should I do research? Does anyone want to volunteer? Why do you wanna do research? Just raise your hand. Yeah. To gain new skills.

What else? Yeah. Yeah. To find out if you wanna do research as a career. Anyone else? Wanna share? Yeah. Sorry? Yeah. Looks good on your resume. Professional development. Yeah. Yeah. Definitely. Make connections, networking. Yeah. So those are all really important ones.

Science is also fun, so don't forget that. You also get to learn a lot of cool chemistry, a lot of new skills. And for a lot of you, might be part of your graduation requirements. You can also get paid or get scholarships for doing research, which we'll talk about later. And like some of you mentioned, exploring future careers, seeing if this is something you wanna do in the future, getting marketable technical skills, working with a science mentor, and networking and building, those communication skills and building that, network. And finally, also memorable experiences. You will have a lot of memorable experiences in undergrad research.

So approximately 70% of the UW Madison chemistry majors, participate in undergrad research, and they have benefited educationally, professionally, and personally from this opportunity. So, you might be wondering, what does research entail and how does it work?

So this is kind of a cycle, and usually the way that research works is first, a lot of scientists and researchers, they usually come up with an idea by reading scientific literature, and they try to, think of how to make something new, for example. And based on the scientific literature, they can create, like, their own experiments, and then they'll conduct those experiments to verify, their ideas or see if it supports their ideas or not, based on their results and data. And then they'll analyze their results and data, and then they'll communicate those results, whether that's in, like, a presentation or a poster or, or a paper.

And so as an undergraduate researcher, you may be involved in any part of this cycle, but probably primarily in the helping with the conducting of experiments, generating the results, and analyzing them, and then also communicating them.

4:35 Can I get credit or paid to do research?

So, some of the ways to get involved, with research on campus are, number 1, getting course credit. So if you're in chemistry, you, can get chemistry research credit, provided that the research you do has chemistry content in it. If you are, from another major, for example, you are taking, like, bio 152, you might need research for that. And if you're in, like, chemical engineering, there's, like, CBE 599, biochem 699. But this will vary depending on your major, so definitely check with your major adviser on how you can get research credit.

Another way that you can get, involved is with paid research experience. So, you can get scholarships or fellowships for it, which can be provided through the university or externally. There's also a new program through the chemistry undergraduate research office called funding innovative research experiences, in which you can do like a work study program. And then you can also get paid hourly, but this is very dependent on the professor and the group. So this may not be available in all groups that you join, but it is an option. You can also volunteer, and there's also summer research experiences for undergraduates, which are called REUs, and, we'll talk more about that at the very end. Alright.

6:05 How do I get started with finding a research opportunity?

So how do you get started in undergraduate research? So I we created this flowchart, to kind of explain the process. So we're gonna break it down. And this flowchart is also on the undergraduate, research website. So you can always refer back to it later. But basically, there are, 3 main steps. So first, you wanna decide on your research interests and your goals, and this usually starts about 1 to 3 months before you actually need to join the group because it does take some time to, join a group.

So the way that you do that is you have to first identify your interest, decide on what type you what type of research you wanna do. So for example, are you looking to gain a specific skill set for the potential industry that you wanna work in? So that could be, like, if you would like to work with, like, instrumentation. Maybe you need to look for, like, like, an analytical chemistry lab where they actually work with, instruments and methods and things like that.

You could also, look for research groups that contribute to a broader impact. So a broader impact is things like, you know, you wanna create, clean clean waters. That was what I was interested as an undergrad. So I looked for a group in environmental engineering that did research relating to purifying wastewater.

The other thing is that you could look into an interdisciplinary group. So that means, like, you wanna find a group that does a little bit of everything. So you want a group that does a little bit of, like, organic chemistry, that also does a little bit like material science engineering or something. And that would be something like, for example, material science group or like a polymer chemistry group, which is like a group I'm in. So it, like, touches a little bit of everything. So decide what you're interested in.

Then next, you'll want to identify potential faculty to contact. So we'll talk about the process of looking into it in the next couple slides, but generally, there are two main ways to do this. One is you can network by talking to your professors and TAs and other students who are already in research to see what opportunities are available.

And, the second way is to just look online through departmental websites or through the Wisconsin discovery portal. And so I just wanna reiterate that it is very important to start early, because the process of contacting professors and then, getting responses from them and then trying to find, like, a good fit can take at least a month or more. So it's really good that you're here so that you know what you need to do. Great. So, in at least in the chemistry department and a lot of this can be transferred to, like, other departments as well.

The process is very similar, but at least in the chemistry department, we have 8 of the major chemistry, subfields, and so might be kind of hard to see on the slide. But we have, chemical biology, analytical chemistry, organic chemistry, inorganic chemistry, materials chemistry, chemical education, physical chemistry, and theoretical chemistry.

So if you're interested, you can look more deeply into like each of these areas but, this is just like an overview. So let's just say, for example, you are a premed student and you're really interested in learning, about more about biology and, like, how that applies and, like, the chemistry behind it. And so out of these, which of these do you think would probably be, like, the best fit?

Just raise your hand. Yeah. Yeah. So chemical biology would probably be a good fit. So let's let's say that you're interested in chemical biology. And so on the chemistry website, you can

look at the faculty that do research in chemical biology. And so this is just taken straight from the chemistry website.

And so here are some professors that do some type of research related to this. And, as you can see, for most professors, they have, like, their faculty profile. Let me see if I can find a faculty profile here, and then they have their research website. So, what I recommend is that during this part of the process, you kind of, like, skim skim through these different professors' faculty profiles to see, what you're interested in, what kind of, like, excites you. So, for example, let's say we're interested in professor Blackwell's research. And so, on the faculty page here, you see that she does, like, bio organic chemistry, biopolymers, quantitative biology, and synthesis. And then you also wanna kind of read the research description.

And in the research description, sometimes you might read this and you might be like, I have no idea what that is. But if you read it and you're like, wow, that sounds like I wanna learn more, that's kind of what we're trying to go for here. So don't worry about, like, not understanding the jargon. Just focus on, like, does this interest you to learn more? So for example, you might wanna look for a statement that says something like, on here, we seek to understand how both plants and animals sense and respond to invasion by pathogenic microbes. Okay. And if this interests you, then definitely, like, you can explore further.

So let's say that sounds interesting to us, and, next, you'll want to look at their research website. So I highly recommend, going to all the different professors' research websites because on their websites, they typically have a research overview. They'll have, like, a tab somewhere that says, like, research, and they'll have, like, summaries of their different areas of research or, like, the different major projects that they're working on.

And sometimes, different professors, if they've been, like, highlighted in, news and things like that, they have, like, articles that kind of, give you a broader overview of what they're doing. And so that's what, professor Blackwell has on her website right here.

The other thing is that you might also want to look at papers that are called reviews, and so, and they make it really easy for you. This is a really good website that they tell you like, hey. Read these papers because this will give you kind of like the TLDR on what you need to know about their research. And, again, when you're reading these papers, don't worry if you're not if you're not, if you're not, like, understanding everything, again, just focus on, like, does it interest you to learn more? Because, that's kind of what the professors are mostly interested in, is your enthusiasm and your curiosity in, pursuing and, like, learning more.

Another resource that you can use is something called discovery portal. org. And so this is just a portal that summarizes or compiles all the research that's being done on campus. So let's say you're not at all interested in any of the groups in the chemistry department, but you don't really know what other departments to look at.

You can go into discovery portal.org to find out. And so you can just search by research topic. So for example, if we search for upcycling, like upcycling polymers. It will list, like, these are the different faculty on campus that do, upcycling of polymers. So this is a little bit more, I would say not confusing, but I would say it's a little bit more complicated to navigate the discovery portal.

So if, for example, you kind of know, like, the general area that you're interested in, I would recommend going to the faculty website first or, like, the department website and, like, look through those different faculty first to kind of narrow down things and then you can come back to this website if you need.

13:55 How do I email professors to ask about undergraduate research opportunities?

Okay. So let's say that, you're now interested, doctor Blackwell's webs, Blackwell's research group. And so in order to get into the group, you'll have to email professors to introduce yourselves and ask about undergraduate research opportunities. And the main way to do that is, again, talk to them if you're talk to them in person if you're in their class. You can also cold email them if you don't know them at all, and we'll talk about, like, the structure for those emails in a bit.

Additionally, some professors do send out ads, and that could be through the office of undergraduate research or through the chemistry connect the chemistry newsletter. And so if you're looking for an undergrad research position, sometimes it's really good to, like, read through those things and see what is what they're looking for. And then, generally, the guideline is to follow-up within 1 or 2 weeks. And the way that you'll do that is by replying to the previous email so that the professor sees that you're following up.

So you might be wondering, okay, what what are professors looking for? And these are just some general qualities that professors typically look for in students. And so this can differ per group, and you can ask them directly if you'd like. But, generally, it's important to show initiative. So that means reaching out to faculty, showing them that you've kind of read a little bit about their work and that you're interested.

So showing that you're curious about the research topic, showing that you're willing to learn new things and from mistakes and your failures because that will happen a lot in research and, like, being able to, like, bounce back from that is really important. The other thing is that, they wanna make sure that you're responsible, so that means, like, showing up on time, doing what you say you will do, and following lab safety and procedures.

The other thing is that, they also wanna make sure that you're, like, patient. You understand that research takes time because, like, scientific results and, like, the skills that you gain, is not something that will happen overnight.

It is a process. So just keeping that in mind. The other thing is that a lot of professors are, they wanna make sure that you do at least that you can commit at least a year to do research. So that's about 2 semesters, just because it takes a lot of time and effort and resources to train somebody.

So if if you're only willing to do, like, 1 semester, it might be really difficult to be to find a to find a lab. The other thing is that generally, there's not a minimum GPA to do research, that I have heard of, but the important thing is that you are a student first. So that means that before you do research, I think the professor generally wants to make sure that you're doing well in your classes, or at the very least that you're you're able to, like, manage your time and your abilities to balance, like, the research work and your coursework.

Okay. So, the next part is just a kind of, like, template or formula for sending an email. And so, this will also be on the website, so you can always refer back to it later. So we'll just talk through it really quick. But basically, the standard process of writing the email is first, of course, you wanna introduce yourself. Say hello, professor blank. My name is blank. And, state your purpose. You know, like, say, I'm really interested in doing research because of, you know, whatever reason you just said earlier, whether it's say, like, gain skills or to see if research is for you.

And then also give some background on your experience. So, you know, saying I'm a sophomore chemistry major with an overall GPA of 3.4, and I've taken these classes. And that just kinda gives them a, idea of where you're at in your undergrad career and kind of, what general knowledge you already have. Then you wanna talk about your interests. And so this is why it's important to understand your interest ahead of time and why you're interested in each professor.

And, so you can say, I've always been interested in polymers, and I would really like to understand, like, their environmental impact. And then you can connect this to a specific project that they're doing, and, you know, you can say, I see that you're conducting research on biodegradable copolymers, and I wanna, like, learn more about it.

I would probably recommend being a little bit more specific, but that's just like the general idea. And then finally you wanna conclude the email by asking directly if there are any opportunities for undergraduate researchers this semester. And say, if so, may I set up an appointment to further discuss your research and this opportunity?

And so the reason why it's really important to ask this question at the end is so that, this can increase your chance of the professor at least telling you yes or no kind of straight up. Because if you just kind of leave it as a sentence, like, I was wondering if you have opportunities for undergraduate research.

They don't see it. Like, they won't see the question mark, and they might just, like, kinda skim it. So asking a question like that will kind of help. And then make sure at the end, you know, just say thanks for your time. I look forward to hearing back from you. Okay.

So after we've sent the email, like I said, if you don't have a response after 1 or 2 weeks, follow-up with the professor at least twice by replying to the previous email so that the professor sees that you're really interested, you're being persistent. Some professors kind of see it as, like, the first test to see, like, are you really interested in our research?

And if you don't follow-up, they might just think that, like, you're not that interested. And so, you might wanna do that. And if you don't get a response after, like, 2 follow ups, so that's like let's say a month has gone by and you haven't heard anything, I would just consider looking at other groups.

So I would recommend kind of doing this multiple professors at a time because a lot of times professors are just busy and they don't reply back or they don't see it. It's nothing personal. It's just, like, they get a lot of emails or they just don't wanna respond. Who knows? But if you get to that point where you're like, you know, it's been, like, 2 months and I haven't gotten any emails and I really need help finding a group, that's when you can come to the office of undergraduate research, and then we can also help you out there.

20:30 How do I prepare for a meeting or interview with a professor?

So next is, if you did get a reply, then the next step is to meet with a professor and your potential mentor. And so your mentor is not the professor directly. Usually, it's like a grad student or someone, who already has a PhD, but is working in the lab. So like a research scientist or the postdoc. And this is your opportunity to determine if it's a good fit for you and to discuss the project and the expectations.

So a lot of, professors may just have, like, a meeting, may not be an actual interview, but, basically, the purpose of the meeting is to just kind of see if, you're interested in the work still and that you get along with the professor and your and so it's important to continue to stay engaged and curious through the process.

And so some professors may ask questions, may have, like, a very formal interview process, but some may just be like, hey, let's just talk about the research. And then you guys just talk, and then they just kind of see, like, you just see what your vibe is like, I guess. But, some of the questions that you might be asked is, like, you know, why do you wanna do research in the group?

What do you hope to gain from conducting undergrad research? How many hours do you plan to commit to research per week? And, usually, it's, like, at least 3 to 9 hours. So we we'll talk about, like, credit hours and stuff later. But, for making progress in research, they wanna make sure that you can come, like, weekly. And, again, how many semesters do you plan to stay in the lab? So this goes back to at least committing a year, so at least 2 semesters.

And then finally, make sure that you have prepared at least 1 or 2 questions either about the group or the research and the expectations. So, you can ask any of these questions here. And this, again, just goes to show that you are really interested in the group because if they, like, tell you everything about the research and they ask you, do you have any questions? And you just say, no. They might take that as you're not really that interested. So try to find something to ask about. Okay.

Some frequently asked questions from you all from the RSVPs.

Some of you asked, do we need prior experience to do undergrad research? No. But it's important to be curious, hardworking, and organized. Some of you are really against cold emailing, and do you have to do that? Yes. If you wanna connect with a professor that you'd currently don't have any connections with, but if you have, like, a second degree, meaning, like, you know a friend friend who knows a friend, a 3rd degree, whatever, try to see if you can leverage that. And, if you have, like, a TA who knows somebody else, ask them to introduce you.

Sometimes that helps a lot. And so that leads into the third question, which is, like, what are other methods to contact professors? So is that networking? And the other question was, what are some classes that are useful or helpful for research? So, CHEM 260 is a course called interim research, and that may be offered in fall 2024. That will be taught by the next undergraduate research director, and that course basically is kind of like this but more intense where you kind of learn, like, how to read a paper, how to make a poster, how to

present, and how to write research proposal, and things like that. And so if, you're interested in doing research and kind of, want something to kind of complement your research experience, that might be for you.

24:00 How do I enroll to get credit for research? How many credit hours do I need?

Okay. So now that you're in the group, you just need to do some administrative stuff. So we have something called a research authorization form. This is on our website, and this is a form that you have to fill out with your mentor and PI just to make sure that you're all on the same page about when and you're gonna work, how many credits you're gonna take, and, what projects you're gonna work on.

And then you'll submit that to the Office of Undergraduate Research. And then, yeah, this is the this is on the website. So you'll just download the form, and you'll fill it out on paper and, get it signed by your professor in person. And And then after that, you're gonna scan it and upload it to this portal, here. And then after we have that information, then we can give you your, enrollment information so that you can enroll for credit.

So if you want to take, research for course credit, this is kind of the breakdown. And so this part is specific for chemistry. So if you're in a different department and, you want course credit in that department, check with your adviser over there. But, generally, if you take one credit hour, that is 3 to 4 hours of research per week, which is, 45 to 60 hours per semester. So most students do 2 to 3 credit hours, so that means 6 to 12 hours of research per week. Yes. Oh, yeah.

So if you have less than 54, like, total credits at the university. Yeah. Right, Katie? Yes. So if yeah. So if you have less than 54 total credits here and it's your 1st semester of research, then you would sign up for CHEM 299. And if you have more than 54 total credits or you're returning this CHEM 699.

And so, again, this information will be updated on the website with the research authorization form so you can, like, check it out. But the other thing is that we also check to make sure, on our end. So it that's why it's very important that you fill out the form correctly. Okay. So like I mentioned, in order to enroll for research credit, you do have to get, like, information from the undergrad office to enroll. So once you get that approved, we'll send you that information. You can enroll, and then we'll send you information about safety training.

So since you are doing research, chemistry research on campus and getting chemistry credit for it, it is important that you say you do safety training even if you do something like computational research in which you don't walk go into a lab. But the reason why you need to do it is because you're around other chemistry groups, and so and safety is important. So that's the other part of it.

26:53 How do I make the most of my experience as an undergraduate researcher?

Okay. So, the next part is just kind of some general tips for, being an undergraduate researcher and kind of how to make the most of your experience. So once you start

research, it's really important that, you know, you work with your mentor and you understand what the project is and what your goals and mutual expectations for each other are, and that you work safely in the lab with your mentor's supervision. And if at any point you experience challenges with your research, again, the chemistry undergraduate research office is there to help support you.

It's also really important to connect with other students in the undergraduate research community. So that's, for example, like the chemistry undergraduate research board or CURB. So we have a couple of representatives here today who will serve on the panel in a couple minutes. The other thing is that if you're doing research, you know, you might be interested in doing research at other universities, getting scholarships for it, going to grad school, whatever. So you might want to leverage that opportunity and apply for those things.

And then finally, you might also want to present your research. So for example, they have, the undergraduate, poster symposium here. We also have the chemistry poster symposium, and then you could also attend conferences in your field so you can go to, like, another city and present your research. You could also write a senior thesis if you want.

28:15 Tips for Undergraduate Research

Some general tips for undergraduate research. A lot of people are always concerned about, balancing research and schoolwork, which is, you know, very normal. And so, generally, what we recommend is that you plan your schedule in a way where you kinda have, like, 2 to 4 hour blocks in the week because 1 hour gaps are not usually enough to do extensive lab work. But, of course, this depends on, like, the type of research you're doing and what, like, is required. So once you join a research group, you can talk to your mentor about that.

And that's why filling out that research authorization form is really important because that's when you can talk about those things. The other thing is to take opportunities to present your results and your progress. And so, you can present at group meetings, at poster presentations. Publications for undergrads are pretty rare, because projects usually take, like, 4 or 5 years. So if you're joining in, like, your sophomore year, it might be, like, another 3 or 4 years before it's actually published. So just kind of keep that in mind when you join a group. It's very unlikely that you'll be in a group for a year and then have something that's publishable.

Finally, make sure you advocate for your goals and your needs. Always speak always communicate with your mentor, your PI about, like, what you wanna gain from the experience, and then, you know, come up with an action plan and follow it. And then also leverage all the university resources and the networking opportunities. There are, like, so many professional development opportunities here on the campus, like, either through the chemistry department, through other departments, and just like taking the opportunity to learn and, apply those skills is really important.

30:05 Can I do research during the summer?

Okay. So the last part is about summer research opportunities. And so, there's a lot of different acronyms for them, which you see here, which like REU, SROP, SURE, SURF. Basically, they're all summer undergraduate research opportunities. And so, some of them

are opportunities to do paid research at another university. Some of them are for here, and these are on our website. So we'll also update this as well.

But, basically, you get paid a stipend for the summer to do research for 40 hours a week. So if you're really curious about what is grad school like, this is a great opportunity to see if you really like research because you will be doing it 40 hours a week. So applications for these usually open in November, and they're due by early February.

So, in the fall, just keep an eye out. You can also, like, look by different universities. So, like, let's say you really wanna go to New York. Find a summer research opportunity in New York. So you can also do that. For but for these applications, you usually need a letter of recommendation. So, that's why it's really important to reach out to your professors now at whatever stage you're at and, you know, have them get to know you really well so that, like, when you get to this point, you can write a letter of recommendation. And so, CURB is working on a letter of recommendation guide, so we'll share that on the website as well.

Additionally, these summer research opportunities are somewhat competitive, because a lot of people want the opportunity to do research elsewhere. But I still highly recommend that you apply to these, because, one, it's really fun because, when you go there, you might be the only person in, like, that particular lab, but you're usually there with, like, a group of, like, 15, 20 other students who are, like, in other labs. So it's kind of like summer camp, but, like, science.

Okay. And just to kind of close this all, just to share a little bit more about me and just for you to kind of see, like, what research can do for you, I guess. For me, I have been doing this for, like, 10 years, which I was like, this is a long this is a long time ago. So, like, 10 years ago, I actually didn't know anything about undergraduate research. We didn't even have, like, intro to research at my university. I just kinda, like, fell into it. But in my undergrad, I, like, joined 2 different research groups just because I was interested in, like, 2 different things. And throughout my time there, I learned a lot, and I got a lot of opportunities. And I finally graduated with, like, a 3, 3, 4. So just just goes to show you don't really need, like, a super high GPA to do research.

Like, it's fine. But after that, I started working in the chemical industry for about, like, two and a half years. And, I always thought, like, you know, I still really wanna go to grad school because I wanna, like, expand my scientific skills, and so that's why I started my PhD here in Madison in 2021. And just for reference, like I mentioned, when you do undergraduate research, it is a long process because my undergraduate work was not published until 2022. So So that was, like, 4 years until after I graduated. And then the other one was, like, in 2023. And so, just kinda to put things in perspective, like, you know, research is a long journey if you choose to take it, but, I feel like I've learned a lot about myself and a lot about science, obviously, by doing all this.

And so, you know, now I'm a PhD candidate. I'm still here. So, anyways, if you have questions about that, you can always ask me later, but, just wanted to show you that even if you choose to, like, not go into research, you know, for as your career, like you mentioned earlier, you can learn a lot of skills that you can leverage, in your professional life.

35:30 Chemistry Undergraduate Research Board (CURB) Panel Q&A

Okay. So, now we're going to switch over, and we have our chemistry undergraduate research board or CURB. They are our representatives for undergrad research, and so they will be doing an open q and a. So, if you have questions, just like raise your hand or does the does the thing work? Can someone test and see if the thing in the center works?

Speaker 3

Testing. Testing. 1212.

Speaker 1

Okay. It works. Alright. So yeah. So here we have okay. They're not sitting in order, but that's okay. We can do it. Yeah. Whatever. Okay. They're gonna do their introductions. Oh, yeah. Yeah. Just ask someone to take after if that works.

Speaker 4

Perfect.

Speaker 1

Wait. That's not the right QR code.

Speaker 4

I just thought that we can catch him before the Yeah. It's done. That's okay. I think.

Speaker 1

Yeah. Alright. So here's curb, and you guys can just introduce yourself. And if you have questions, just raise your hand. I'll call on you and then use the, whatever that is called to ask your question. Hello. Okay.

Victoria

My name is Victoria. I am a senior undergrad researcher in the Limb Lab. I'm a major double major in chemistry and biochemistry. Next year, I'm going to grad school. So if you have any questions about that, about that application process, research in general, I got you.

Hunter

Hi. I'm Hunter. I'm a excuse me. A senior, in, biochemistry and neurobiology. I'm graduating this May. I'm, do I do organic synthesis in the Wiccans Lab, with Zachary Wiccans. And I am currently in the process of kind of, like, looking for some research internships that are more like bio, chemical or medical related, because I'm hoping to go to medical school in the future.

Brendan

Hi. I'm Brendan. I'm a junior, and I'm a biochemistry and microbiology double major with a certificate in global health. And I work in chemical biology with the Blackwell lab that Britney previously mentioned. But, yeah.

Elizabeth

I'm Elizabeth. I am a senior chemistry major. I work in the Brunnold lab, so that's gonna be bio inorganic chemistry, so a mix of chemical biology and inorganic. And I currently have a job lined up at a national lab for after graduation, and then I'm planning to go to grad school after that. Press the thing on the bottom.

Q1: What were the first things you guys did when you joined your labs? Like starting thing you did?

Q1: Does that oh, this I've played lean in like this. This is it doesn't get any longer than this. What was, like, the first things you guys did when you joined your labs? Like, like, starting thing you did?

Victoria

So my gen chem and o chem experiences were both online since I started here as a freshman in 2020. So I learned how to use a pipette, And then I learned how to make a gel. And then we went up from there in following protocols and learning about different biochemical reagents And lots of cloning. I don't know if any of so for biochemistry, big part of it is getting your protein into a DNA that can be expressed by a cell. So I did a lot of that. Still do a lot of that. But, no. First thing, learning how to pipette.

Elizabeth

So I was in I initially joined one group and then I switched groups because the first group just wasn't the right fit for me. It wasn't the type of research I was into. In that group, it was more of, watching stuff happen. There wasn't much research going on at the moment. My current group, I was trained on doing, a kinetic assay, so measuring the efficiency of catabolizing enzymes in the body. Then I was basically trained how to do that on my first day going into research, and then I was watched doing it twice, and then I was left alone to do that for the rest of my 1st semester in lab, and I just did it constantly.

Brendan

Yeah. So, for me, I started with something called peptide synthesis. So, basically, my lab synthesizes peptides that we put into bacteria, and those, peptides will basically affect how well the bacteria grow. So I started with actually synthesizing those peptides and then later moved on to biological reporter assays, which is where I would just essentially measure the bacterial growth and then plot curves that would show, how these peptides affected their growth either positively or negatively.

Hunter

I started out I also had, gen chem and organic chem online, and then, I actually got in touch with my o chem professor online. And then getting into, his lab, I, that was my first time, like, in a college level, like, type of laboratory. I hadn't been in any other things. It's all been was

all online, and I learned how to do, electrochemistry synthesis, which was really cool. It was something I'd never heard of, and I had yeah. I guess I'd first, like, hands on kind of experience. So it was, like, really cool to be able to apply what I already knew.

Q2: How much of a limitation do you think it is for undergraduate students who haven't taken higher level chemistry or biochemistry courses to actually understand what's going on in the lab they wanna join?

Q2: Okay. So how much of a limitation do you think it is for, like, undergraduate students who haven't taken, like, higher level chemistry or biochemistry courses to, like, actually understand what's going on in the lab they wanna join?

Victoria

So I actually started in my biochemistry lab before I had ever taken a biochemistry class. So not that much of a hindrance. It is very helpful. Once I learned the biochemistry, it was very it was much more helpful in how quickly I picked up the new concepts in the material that we were applying, but before it was just I'm putting solutions into a tube and only after I took biochemistry did I figure out, oh, this is actually what I'm doing. But, nah. I started and yeah. No. I took a biochem class for the first time, like, of about a year into my biochem lab experience. So not that much of a hassle.

Elizabeth

I mean, a lot of us had the same experience with COVID being our first or first or first two years of college, so none of us had in person labs. So you're going in never having a lab before. And then also, research is really specialized. Like, it's not really gonna be on stuff that you cover in your classes. So the likelihood that you understand, like, what you're doing in your lab aligns with what you do in your classes is very low. But also, I'm, like, 3 semesters into my lab at research, and I still barely understand what's happening. I have to have it reexplained to me constantly, which my grad mentor is very patient with me, just asking really silly questions like, what is it a basic amino acid? Because I forget a lot.

Hunter

Yeah. I guess, similarly, I had, I only the only experience I had in organic chemistry at the time was taking, Chem 343, with my professor. And so, like, I had only had, like, some very basic, like, written molecules and how those interact and some understanding of things, but absolutely, like, 0 hands on work. And, like with things like purification or columns and different types of, like, why am I adding things? I had absolutely no clue, honestly. So it it definitely comes, I would say, as you go. Like, with electrochemistry, there's, not even there's not any good, like, undergraduate courses here for, understanding that.

I don't even think there's, there's, like, a few grad level courses, but, like, everything that I learned was totally in lab, like, hands on, with my mentor who is also very patient. And yeah.

Brendan

Yeah. Overall, for my experience was very similar. I started out as a freshman and most of, like, the peptide synthesis stuff that I was doing is all, like, ochem. And a lot of the techniques I was using was in a chem, so analytical chemistry, which were classes I had not

taken yet. But overall, like, because I had such a good mentor, which is, I think, a commonality among all of us, you get to, like, ease into those, lab techniques, and over time, the longer you're with those labs, you learn more and you start to see some applications from class. So a lot of the research that I have been doing, I didn't really understand until probably about my junior year, which is the year I'm in now. So I think it's definitely like it's gonna take some time, but I don't think that should discourage you at all.

Q3: What's the best way to get in contact with professors in more medical centric fields or how do you get EMT certified or volunteer or hospital?

Q3: I know that one of you guys up there is also going to medical school and I am hopefully going to medical school after I do my undergrad. And I was wondering if I guess knew, like, the best way to get in contact with professors in more, like, medical centric fields or how do you get, like, I don't know, EMT certified or like volunteer or hospital. Like, how do you get it? Because there's not really a pre med major at this school. So I was like, do I go bio? Do I I don't know. Do you have any advice for that?

Victoria

I have. I also. You can go first. You're the one. Okay.

Hunter

Yeah. I guess, I I've been kind of stuck in that same kind of thing a little bit because I, for 1, did not reach out to like professors because I was really the organic synthesis lab I joined, was, like, I absolutely loved the people in it. I loved the research I was doing and everything. And it's not because I am not enjoying it that I'm at, that I was, not looking for other labs or looking for something in, like, biochemical, just simply for, that I do need more, like, hands on biomedical research. I am currently in the process of, like, emailing professors who are in, like, departments of, neuroscience and stuff, and that's the the best way that I found to reach out to them. I definitely say if you have courses with, professors who do research you like, I would try to go to their office hours or connect with them and just talking in any way you can with, yeah, like reaching out in emails, I guess.

Victoria

Yeah. One of the other undergrads in my lab that I worked with is that was also her plan was to go to medical school. And so, she had this conversation with our shared mentor and was like, hey, I wanna do this. How can I be best prepared for this? And so, our mentor had her work on more hands on assays.

So, stuff that I dealt with more of, like, the theoretical, like, oh, this is the instrument and this is how the instrument works, where she got to do more hands on stuff and then she is now at a, I believe it's like a burn treatment lab at the at Wimmer is what it's called. So, over by the hospital area. So, even getting any basic lab hands on, just running a gel assay is what she was doing. So, she was working with a gel.

It was very technical. And so, she got that practice of repetition and doing motions with her hands over and over again since she wanted to go into more surgical fields. Now, she's over researching burn like, how to best treat burn victims. So, it even getting some basic lab

experience with, like, a basic biochemistry works really well for getting an in at a next school or a next place.

Brendan

Yeah. I'm also premed. And, in terms of, like, the research that you do from the people I've talked to, I don't think med schools care as much what kind of research you do. They wanna see that you've done some, but it's not entirely I don't think you have to do a specifically clinical research. If that's something you wanna do, you can, as Victoria was saying, start out something like maybe biochemistry or, like, chemistry and then move into clinical work later.

In terms of your EMT question, I'm also a licensed EMT. And for that, you can take, like, a course, that's usually not offered here, but, like, Madison Area Technical College has one in the summer or during the semester.

Hunter

Just to add to the, like, not having to actually do the research in your field, that was, like, when I first came and didn't, to to Madison, I didn't understand, like, anything about, like, undergraduate research. I thought I would do, like, chemistry research, biology research, like, work my way up to, like, through the fields or whatever of what I was learning through those years. But I, was also my, PI has also presented, like, other labs and other, like, recommendations for more bio based labs, that I could do. So even just having, like, that connection and that, with your professor, like, opens up a lot of avenues for you. And I definitely say do what you enjoy over what is, like, you might think is a standard maybe.

Speaker 2

I mean, I'm ex pre med because I fell in love with research so much. And that's sort of what professors are gonna try to make you do, but, follow what you wanna do. There are a lot of departments though that, like, if they line up more with, like, medicinal stuff. So there is, like, medicinal chemistry and that's more in, like, the pharmacy school, but they do count for, like, chem research. You can count them as chem research if you're a chem major or, there's other like, I think the pharmacy school has their own pharm research too. So if you're looking more for, like, the medicine side, then look at the pharmacy school. But also, biochem is gonna have a lot, and chemical biology is gonna be a lot more, like, body based and then you can really understand how the body works.

Katie McCullough (Chemistry Advisor)

So Yeah. I'm gonna jump in. I'm I hope this is I'm Katie McCullough. I'm the undergraduate chemistry advisor. That is all fantastic advice too, so great job you guys with that. I was gonna add so if you end up getting involved with research in another department and decide you do want to major in chemistry, as Brittany had up there earlier, you would first want well you can still continue doing research in that area, but if you wanted to count towards your chemistry major requirements you would just need to submit that 1 page proposal of the research that you're doing or that you're going to be doing and then the undergrad research office would review that to see if there is enough chemistry to be involved or involved to count towards your major requirements and then we can submit a DARS exception so that can count but we do have plenty of pre med students who are doing research too in other

departments, who maybe thought well okay it doesn't have enough chemistry to count towards our major requirements, but I really really really love it and that's okay too. We do have other courses if you are thinking of chemistry that can fulfill that requirement so any type of research is great.

The other thing I just wanted to jump in on is just in case there are any 1st year students in here who are pre med who aren't aware of it, we have a center for pre health advising on campus and they also have 1st year drop ins on Fridays. They have advising appointments available and events for other students who are interested in pre med. So if you're considering pre med, I definitely recommend visiting their office because there are lots of things outside of the classroom and outside of research and like being an EMT and doing volunteering hours that they can absolutely help you with and give you advice on as well.

Q4: Those of you who are looking to continue to graduate school, how did you make that determination, and how did you go about looking at schools that would reflect your interests?

Q4: Yes. With regards to those of you who are, looking to, continue to graduate school, How's how did you make that determination, and how did you go about, like, looking at schools that would reflect your interests? Because there's obviously a lot of options out there.

Victoria

We're debating which one of us is going first. I guess I'm going first since I will be going in the fall. So I worked a summer in a blood bank and I got to do a lot of more technical, like, just hands on more industry work of I was preparing a sample and it was shipped off to California to do to be have done tests on.

And over the course of the summer, I realized, oh, what what tests are we running? Why are we running the tests? And those are questions more of, like, the complete research story, and that's something that I fell in love with at my current lab as well. I study telomere length maintenance and so I have absolutely fallen in love with the process of looking at a question, designing some way to test it and then keep going and, like, understanding the chemistry and the biochemistry behind it. So, I absolutely fell in love with the process and that's sort of what guided me to be like, oh, I want to understand the complete story. That's something a PhD provides.

As far as looking for programs, I started out with where I wanted to live. So I'm from Minnesota originally, and I have I want to live on an ocean. I would like to see an ocean. So I started looking at schools based off geography a little bit and then also then I looked at the faculty at those schools and just said, okay, I think I want to do right now I'm in, like, a structure function lab.

So, I do the function, I'd run the biochemistry, but I see these beautiful crystal structures that we make, this cryo EM work that we do. And I'm like, well, maybe I wanna do that. So I looked for schools with cryo EM machines. I looked for faculty who did those types of studies and then applied for them. And yeah.

Elizabeth

So I was initially premed, and then I started in my current lab. And just, like, sitting there and working with the other people in my lab and trying to figure out, like, troubleshoot a problem and figure out what's happening just made me really like the purpose of research and, like, trying to just answer questions that haven't been answered before. Also, it just, like, one day, I was sitting there pipetting for 4 hours, and I went, this is fun. I wanna do this for the rest of my life.

But I knew that I wasn't, like, exactly ready for grad school yet, so I wanted to do a gap year, which is why I'm going out to do, like, a post bachelor's in, uranium chemistry out west. And so, like, that's, like, a 2 year break to figure out if I really, really wanna go to grad school and just, like, a break from school. But then, for finding schools, it's a lot of working with my, PI who helps in advising.

He's gonna help me get all my application materials and, like, check for this semester. So when I'm ready to apply, I can apply. And for grad school, there's so many grad schools that just pick based on where you wanna go. Like, Victoria, I wanna go back to the coast because I'm from the coast, so either coast is fine with me. And then you just look through the professors there and you read their research and you just find something that, like, sparks your interest.

Victoria

Also, if it's a biochemistry program, they fly you out and they wine and dine you if you get an interview. And so then you get to see what the vibe is like on the campus and see if you'd be a good fit for the school.

Elizabeth

I think they do that for both of us.

Victoria

For chemistry after you get admitted. Never mind.

Brittany

Just to add on to that, so if you are at that stage where you do chemistry and you're like, I'm really interested in chemistry grad school, there are programs called, like, preview programs, and this is where you can see the university before you apply to the school. And so if you're interested in that, we can talk about that because that's how I got in here.

I did not think I was gonna live in Wisconsin, honestly, but, they they brought me out here and I, like, really liked the chemistry that they do here. Like, this is like a top ten school for chemistry. So, it was a just great opportunity for me. So there are a lot of universities out there that do this. It might not be called a preview program. I'm not really sure, like, the wording, but, if you ask around, or if you're interested in that, that's something that we can also help you find as well.

[transition to pizza time]