

Intro to Research Transcript

0:00 Welcome to Intro to Research!

Hello, everyone, and welcome to Intro to Research. This workshop will help you learn how to find a research group on campus, join the group, and also potentially get paid or get class credit for your research experience. So you can ignore the sign in QR code. This is for the in person workshop only. So what's research? Research is an inquiry or an investigation that makes an original, intellectual, or creative contribution to your discipline. And this is from the Council on Undergraduate Research. So why should you do research? Well, there are a lot of reasons, and some of the main reasons are science is fun. You can learn cool chemistry. You can complete complete graduation requirements. You can potentially get paid or get scholarships for doing research. Undergraduate research is also a great opportunity to explore future careers. You can develop marketable technical skills. You can learn how to work with a scientific mentor. You can improve your technical communication skills while you're working with a scientific mentor or on a team. At the same time, you can make new friends and connections and memorable experiences. Approximately 70% of the UW Madison Chemistry majors participate in undergrad research and have benefited educationally, professionally, and personally from the opportunity.

1:42 How does research work?

So you might be wondering, how does research work and, like, what do you actually do? So research encompasses, it's a cycle and these are, like, the 6 main steps. First, you usually start off with reading scientific literature. And then from your reading, you can learn how to, create experiments or design your own experiments. Then you will actually conduct the experiments. So then you'll be going to the lab and doing the work, to see if your hypotheses are, supported by the evidence that you have from your experiments or not. So you'll be generating or Other. And this is a cycle, so it just continues. And so as an undergrad researcher, you may be able to touch a little bit on each part of these, in the research cycle.

2:47 Can I get credit or get paid to do research?

So what are some of the ways to get involved? So number 1, a lot of people like to get course credit, and so here are the list of courses that you can get credit for when doing research. So a lot of people take chem 299 or chem, 699, and that's just research credit. If you wanted to do a senior thesis or senior honors thesis, that would be 681 or 682 or 691 and 692. And if you're from a different department, some common ones are like Bio 152, CBE 599, and Biochem 699. But if you do research and it's not listed on here, definitely check with your major advisor. The second way to get involved is to do paid research experiences. So that's, scholarships chemistry undergrad research office called Funding Innovative Research Experiences, which is released every semester. You can also get paid hourly, but this depends on the professor and on the group. So this is not all groups offer this option. 3rd is you could volunteer. And the last one is a summer research experience, which we'll get to at the very end.

4:06 How do I get started?

So how to get started? We created this flowchart, to kind of help outline the steps that you need to take in order to find a research group. So we'll be breaking it down. First, we start with deciding your interests and goals, then we try to figure out, like, what group you wanna join. And then after you find your group, there is some paperwork and training that you have to do before you can start conducting research in the lab. So we'll go through this 1 by one. So first, how to get started?

4:38 How do I decide my research interests and goals?

So first, you have to decide your research interests and goals. And so, how do you do that? 1st, decide what type of research you wanna do. So for example, are there specific skills you want to gain in the lab or specific type of knowledge you wanna learn? So, like, if you're pre health or pre med student, maybe you wanna learn something like, chemical biology or you wanna learn about, organic chemistry, like, if you're interested in pharmaceuticals. The other thing is to consider what type of broader impact you want to contribute to. So, for example, if you wanted to make Pharmaceuticals then you would go into like organic chemistry or an organic group that focuses on that. If you're looking to create, like, better solutions to clean water, then maybe you would wanna look into, like, nanotechnologies that are doing that, things like that. Do you want an interdisciplinary type of experience? Interdisciplinary just means that you have you're doing research that touches on a lot of different fields. So maybe you're doing a little bit of organic type of chemistry, but then you're also doing materials research. So you're like studying the properties of materials. So like for example, polymer chemistry is a great example of interdisciplinary work. Next, you'll need to identify potential faculty that you want to contact. So, we'll go through the process of that in a bit. But, generally, you can do this in 2 ways. You can talk to your professors, TAs, and other students to see what type of opportunities are available, or you can also just search online and cold email. And that's the process we're gonna talk about in this seminar. And the other big tip is that we highly recommend that you start early. As you saw in this slide, it's, we recommend starting about 1 to 3 months out of from when you actually want to join a group because this process can take a while. Okay. So this the next part is specific just to chemistry, but the process is very similar if you're in a different department. Just go to your chemistry or your department website.

6:55 What are the different areas of chemistry research?

So this is Chemistry. And in Chemistry, we have 8 different areas of research that we have broken down on here. So we have chemical biology, analytical chemistry, organic chemistry, inorganic chemistry, materials chemistry, chemical education, physical chemistry, and theoretical chemistry. And so each of these summarizes the different, the different types of chemistry that are done in each area. We won't go into what each of these are. If you're interested, you can look them up later or you can, you know, ask us, you know, for a case by case basis at our office hours or something like that. In general, these are the 8 major branches that our department has split them up into.

7:52 How do I find the right professor/research group to join?

So let's say that you're a student in Pre Health and you're interested in would probably look in chemical biology. And so now, we're looking at the chemical biology faculty and this is just a screenshot of some of the professors that are listed, on the website. So what you'll wanna do is kind of click through each of their, group research websites. So you can see, you can click on this, and it'll take you to their website. And then when you go to their website, you can read more about their research, which we'll explain in a bit. But you can also click on their faculty profile. And when you click on their faculty profile, you'll see a quick summary of what they do. So let's say we're really interested in learning about professor Blackwell's research. So we're looking at, professor Blackwell, and it says her research interests are bio organic, biopolymers, functional materials, quantitative biology, and synthesis. And then there's also this research description here. So you would wanna read that. And basically, it says organic chemistry is in the unique position to provide molecular level insights to biological processes. And you'll just keep reading this and then you'll see if you're interested in what they do. So in this case, it's usually at the end. They say something like, we seek to understand how plants and animals sense and respond to invasion by pathogenic

microbes. Does that sound interesting to you? If it does, then you'll want to learn more about the group. And when you do that, you can click on their group website.

And so here, this is the Blackwell Labs website. And you'll wanna try to find something that says, like, research overview. There will be, like, a tab or something. And then you may want to kind of read through what they've listed on there just to get a sense of the type of research that they do in their group. Some groups are better than others about this, keeping this updated on their website. Some of them will point you to specific articles. Like, here, they, specifically listed articles where they tell you more about Sensing which is just something that their group is very focused in. And so you would wanna maybe skim them, read a little bit about them, kind of get a sense like, does this interest you at all? If it doesn't interest you, move on to another group. If it does interest you but it's just confusing, keep going. It's okay if you think like, I don't really know anything about this. What's important is that you're interested in the topic and that, you have questions and you're enthusiastic about learning more. Okay.

So another, way you can look around campus like if you're not interested in looking just in your department, you can go to discoveryportal.org. And on this website, it just shows all the research that's done on campus, and you can search, just by research topic. And when you search by research topic, for example, we look up upcycling, we'll see, like, these are the different types of researchers that are doing research in this area and then you can kind of see how they're connected. This one's a little bit more complicated to navigate, So I would recommend going to, like, the department's websites first. And then if you're unable to find any professors that are interesting there, then try Discovery Portal.

11:35 How do I email professors about research opportunities?

Okay. So now that you've decided your research interest and goals, next, you will want to, email professors to introduce yourselves and ask about undergraduate research opportunities. So there are 3 ways to do this. 1 is if you're already taking their class, you can talk to them in person. Highly recommend going to their office hours, making sure they know who you are, asking questions and being engaged in general. Number 2 is if you don't know this professor at all, you can cold email them and we'll talk about that in a little bit. And the third one is, sometimes professors will send out ads for undergrad research positions. So these these will be listed, either through the chemistry, undergraduate research office or we post it in the, chemistry newsletter. So you will just wanna keep an eye out for that. And this is specifically for chemistry undergraduate research. So if you're interested in getting on that newsletter, then, you can sign up for it, if you're not a chemistry major. For other departments, I'm not sure how that works but, you'll wanna get in contact with whoever is, like, sharing that information. Or just also talk to your friends who are in those departments. They might also know. Okay. After you send an email, if you don't get a response after 1 or 2 weeks, make sure you send a follow-up email by replying to the previous email. And that just shows the professor that you are keeping track of, like, the status of things that you're you're taking the initiative to follow-up and that you're very interested. And, finally, if you can, you can wanna stop by their office, set up a meeting or whatever. This is just general. We'll talk about how to write the email in a bit.

13:30 What are professors looking for in undergraduate research applicants?

But before we get to that, some of you may be wondering, okay, what are professors looking for in undergraduate research applicants? Okay. So this is a general list of desired applicant qualities and this can differ per group and you can ask people directly or you can ask like your other undergraduate researcher friends or people that you know to see what they think. But this is from our point of view. These are some of the main qualities. Number 1 is showing initiative by reaching out to faculty. Number 2 is being curious about the research topic, curious enough where you've

read their papers that you have questions to ask. Number 3 is being willing to learn new things and from your mistakes or failures. Number 4 is being responsible. So that means showing up on time, doing what you'll say you'll do, and following lab safety and procedures. 5 is being patient. Understand that research takes time. Scientific research, results of skill development are not always immediate. So you have to be patient in, like, the learning process. Additionally, that you can commit at least 1 year to do research. It takes a lot of time and effort to train a new student and grad student mentors are willing to do that but they also need to know that you're willing to put in the time as well. It is very unlikely or very rare that a group will wanna take someone on for a semester. There generally is no minimum GPA, but it is important to remember that you are a student first and so a group will wanna make sure or a professor will wanna make sure that, like, you're doing good in your classes before they take you on as a researcher because that also kind of plays into, time management and balancing your responsibilities and things like that.

15:35 How do I write an email to a professor?

Okay. So now, we're gonna introduce yourself. Say, hello, professor blank. My name is blank. And then state your purpose. You know, I'm planning to go to grad school in chemistry, or I'm interested in gaining some research experiences, just like in general. Just come up with some reason some genuine reason why you're interested in doing research. Okay? Then give some background about your experience. You can say, I'm a sophomore chemistry major. I have an overall GPA of 3.4. I've taken these classes and, I'm currently enrolled in these classes. This just gives them a sense of what you kind of already know and kind of where you're at in your Chemistry career and kind of how long you have to go. Next, you wanna talk about your interests. So this is why we talk about interests first. So now you can say something that you're actually really interested in in their research. So you could say, for example, I've always been interested about polymers and would really like to understand their environmental impact. And it's very important that what you say you're interested in is aligned with their research because if you do not, it is very unlikely that they will reply back because they'll be like, oh, you mixed me up with somebody else or, like, you didn't really read our research. It also helps if you list a specific project from the group that you're interested in. So you could say, I saw on your website that you're conducting research with biodegradable copolymers and would love to learn more about this project. Again, make sure that this is a project that they're currently doing, to the best of your ability which is usually just looking at their website. If you know people who are in the group, you could ask them as well and see, get some insider knowledge. Finally, you wanna ask, are there any opportunities for Undergraduate researchers this semester? And you can also ask, if so, may I set up an appointment to further discuss your research and this opportunity? Asking a direct question like this can help you get a response. It doesn't guarantee it. But sometimes, professors can be pretty direct. They'll just say, yes, we have, openings or no, sorry, we're full for the semester. So if you ask a question, it will at least, hopefully, encourage the professor to respond to you. Then, finally, just say thanks. Thank you for your time. I look forward to hearing back from you. Okay. So, that's pretty much the email. Other tips on the email, make sure that if you are copying and pasting that you put the right professor's name for the right research area that they're in. Okay? And that's very important. So, there is a spreadsheet on the overview page of the chemistry undergraduate, research website that you can copy and you can kinda keep organized about which professors you've emailed, why you're interested in their group, and when when you email them and when you followed up with them. So if you're interested, go check that one out. It's on the website.

18:44 What do I do if a professor doesn't respond to my email?

Okay. So, this continues the flowchart. So if you don't have a response, follow-up at least twice by replying to your previous email. And if you still don't have any response, just go back and consider other groups.

19:00 How do I prepare for a meeting or interview with a professor to join their group?

Okay. But let's say you finally did get a reply. Now it's time to meet with the professor and expectations. So sometimes this can look like an interview or it can just be a meeting, and it can go in 2 different ways. Sometimes, the professors will have questions to ask you. The mentor might have questions to ask for you. But sometimes, it's your opportunity just to kind of get to know what they do and see if you're actually still interested. But here are some questions that they might ask you. They might ask, why do you wanna do research with our group? What do you hope to gain from conducting undergraduate research? How many hours do you plan to commit to research per week? And, usually, this is around, like, 3 to 9 hours, which is about one to 3 credit hours. How many semesters do you plan to stay in the lab? This might not be asked directly but, again, you know, at least 2 semesters is kind of the expectation in terms of training and investing time and energy and resources into teaching you. The other thing is that a lot of times professors or the grad students may present about their research or they may, like, tell you things about the group. They may show you the lab and other, things that you might be interested in. And so it's really important to, you know, be really engaged, come up with some questions about the group, the research, the expectations, research and they ask you, Do you have any questions? And you say, No. And then it just kind of gives them the vibe that you're not really interested activities are undergrads expected to participate in? What type of work other activities are undergrads expected to participate in? What type of work do undergrads typically do? What's the training or mentorship process like? Who will be your direct mentor if you don't already know? Can you see some of the lab spaces or get a sneak peek of the type of work that you would do? Obviously, if they already gave you a tour, don't ask this question. But, yeah, the interview may not actually be an interview exactly. It might just be more of, like, a compatibility check, a vibe check just to make sure that you kind of get along with the professor, the group as a whole, your mentor, just to just to see and make sure that your project, that your goals align with their goals and that it's a good fit. Okay.

21:47 Frequently Asked Questions

Some frequently asked questions, from you all. Do you need prior experience to do undergrad research? No. But it is important to be curious, hardworking, and organized, like I mentioned earlier. Do we have to cold email? Yes. If you wanna connect with a professor that you currently do not have a connection with. If you have some type of second, even third degree connection, leverage that. And you can do that through networking with your peers, with your TAs, talking to the professor directly if you are in their class. And that leads to the other question which is what are other methods to contact professors? And another question was, what are some classes that will be useful or helpful for research? So the chemistry undergraduate office offers a course called Chemistry 260, entering research, and this may be offered in the fall of 2024, and that will be taught by the undergraduate research director. Okay.

22:50 How do I enroll in chemistry research credit?

So now that you have found a group, yay, you'll need to do some paperwork, and this usually is around the 1st 2 weeks of the semester. So you'll need to fill out a form called a research Authorization Form, and this is available on the Undergraduate Research website. And so you can go here, download the form. You'll fill it out and follow all the directions on there. And then after

that, you'll scan the form and submit it through this link. And it's very important that you fill out the form properly the first time because, we need it to process, your enrollment so that you can sign up for research. And so if you don't fill out the form properly, it will delay that enrollment, because we are checking to make sure that we have all the information we need to enroll you. So once you click on that, you can just scan your form in. It's a Google form. So you'll just scan your research authorization form and upload it to the portal.

Okay. If you're taking this research for course credit, general guideline is 1 credit hour is equal to 3 to 4 hours of research per week, which ends up being 45 to, 60 hours per semester. But, obviously, if you do more, I think you're gonna need to multiply that out. So most people do 2 to 3 credit hours. So that goes up to about 6 to 12 credit hours. I mean, 6 to 12 hours of research per week. And so this is the breakdown of which course you should sign up for depending on where you are in your undergraduate journey. So if you have less than 54 total credits and it is your 1st semester of research, then you'll sign up for CHEM 299. If you have more than 54 credits or you're a returning researcher as in you already took 299, then now you're gonna take CHEM 699. And if you're doing Senior Honors Thesis or Senior Thesis, then you'll sign up for whichever one is listed there. Okay.

25:13 How do I make the most of my research experience?

So, finally, once you've submitted your research authorization form, we approve it. You'll get instructions in your email to enroll for research credit and also safety training. And, once you finish your safety training, you'll be ready to start conducting research in the lab. So when now you're in the lab. And when you start research, you'll be working with your mentor. So it's very important that you discuss the project and you set goals and mutual expectations for each other, Meet regularly to discuss your research progress. So this could be weekly or biweekly. Next, you'll wanna make sure you're working safely in the lab with your mentor supervision. So that means always ask for help if you're unsure. It's better to ask for help when you're unsure than to accidentally get hurt or cause an accident or worse. The other thing is to reach out to the chemistry undergraduate research office if you are experiencing challenges with your research. And, also, connect with other students in in the undergraduate research community, such as the chemistry undergraduate research board and so or CURB. And so CURB hosts undergraduate supergroup, and these are events that are open to all undergrads interested in research or who are in research. You can also apply for research opportunities, scholarships, graduate school after you have, undergraduate research experience and when the time is right. And you can also present your research, attend conferences, write a senior Thesis, if you want. Okay.

26:55 Tips for Undergrad Research

So some tips for Undergraduate Research. A lot of you are concerned about time management in blocks usually. And so this really depends on you and your mentor and the project's needs. But in general, 2 to 4 hour blocks at a time are recommended because 1 hour gaps are not usually enough for doing extensive lab work. And then using some type of app like Google Calendar to keep track of your time commitments is generally a good idea. Take opportunities to present results. So this means, like, you could present at group meetings. You can create a poster and present that. Publications are typically rare for undergrads, because projects can take longer than the time that you are in the lab. Just for context, when I did undergraduate research, my work was not published, until, like, 4 or 5 years after I've graduated. So that's kind of the timeline, but know that your work is valued. And But that's why poster presentations are a great opportunity to present. Next is to advocate for your goals and needs. So make sure you communicate with your mentor and your PI about what you wanna gain from the experience and, you know, follow your action plan to accomplish it, leverage university resources, And if there are other issues, you know, that you feel

like you're unable to resolve within your group, that is also how the Chemistry Undergraduate Research Office can help you as well. So just know that you are supported and that there are resources, and people who are available to help you.

29:15 Summer Research Opportunities

Okay. So the last area that we'll talk about today, is summer research opportunities. And so, another term for them is research experience for undergrads. And what they do is that these are summer experiences that are paid and they're typically at another university, and they pay a summer stipend for you to do research. They cover your housing. And it's just a really fun opportunity to do science at a different university. So there's a lot of terms for them. So they're called, like, REUs or SROPs, which are summer research opportunity programs, I believe, or, like, SURE, which is, like, summer undergraduate research experience, or SURF, which is summer undergraduate research fellowship. So just kind of Google these names. And these applications usually open in November, and they're due by early February. So for this season, it's already closed, but just keep an eye out in the fall. And a lot of these research opportunities do require a letter of recommendation. So it's really important to start building relationships with your professors now, to get those letters of rec for these programs. These programs can be somewhat competitive, but it's still worth applying to because it is really great opportunity to to live somewhere else for a couple months and everything is paid for, and it's usually really fun and, you know, you bond with the other people that are also in that program. So it's not just you. You'll probably be the only one in that particular lab that you're going to, but there's usually, like, a cohort of you at the university. And so on the undergraduate research website, we do have some of these opportunities listed here. There are some available on campus, but you'll just have to search through the list and see what type of research you're interested in doing.

31:28 Contact the Chemistry Undergraduate Research Office!

Okay. So that is all for this online presentation. If you have any questions, please visit us at the chemistry undergraduate research office. You can email us at this email here or visit our website, undergraduateresearch.chem.wisc.edu, at any time.