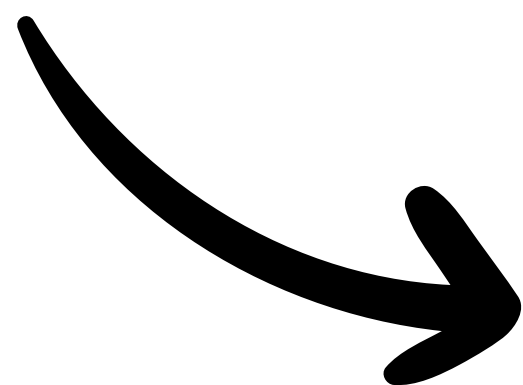


Intro to Research

"...an important high-impact educational practice that can enrich the Wisconsin Experience for undergraduates."

Please sign in!



Office of
Undergraduate Research
DEPARTMENT OF CHEMISTRY
UNIVERSITY OF WISCONSIN-MADISON



*An inquiry or investigation...that makes an
original, intellectual or creative
contribution to your discipline*

FROM THE COUNCIL ON UNDERGRADUATE RESEARCH



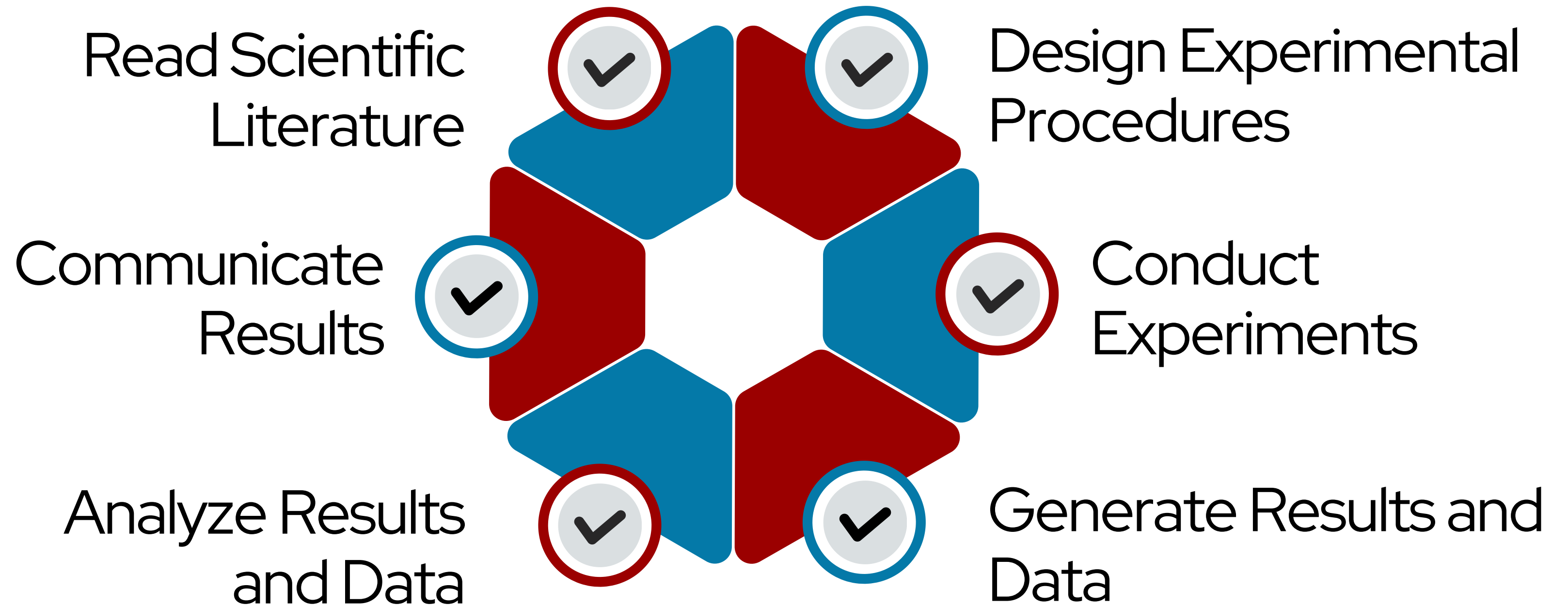
Why Should I Do Research?

Why Should I Do Research?

- 01 Science is FUN!
- 02 Learn COOL chemistry
- 03 Complete graduation requirements
- 04 Get paid/scholarships for doing research
- 05 Explore future careers
- 06 Develop marketable technical skills
- 07 Work with a science mentor(s)
- 08 Improve technical communication skills
- 09 Make new friends and connections
- 10 Memorable experiences

Approximately 70% of UW-Madison chemistry majors participate in undergraduate research and have benefited educationally, professionally, and personally from the opportunity.

How Does Research Work?



Ways to Get Involved

01

Course Credit

- CHEM 116
- CHEM 299/699
- CHEM 681/682
- CHEM 691/692
- BIO 152
- CBE 599
- BIOCHEM 699
- Check with your advisor!

02

Paid Research Experience

- Scholarships/Fellowships
- Funding Innovative Research Experiences (FIRE)
- Hourly (depends on professor/group)

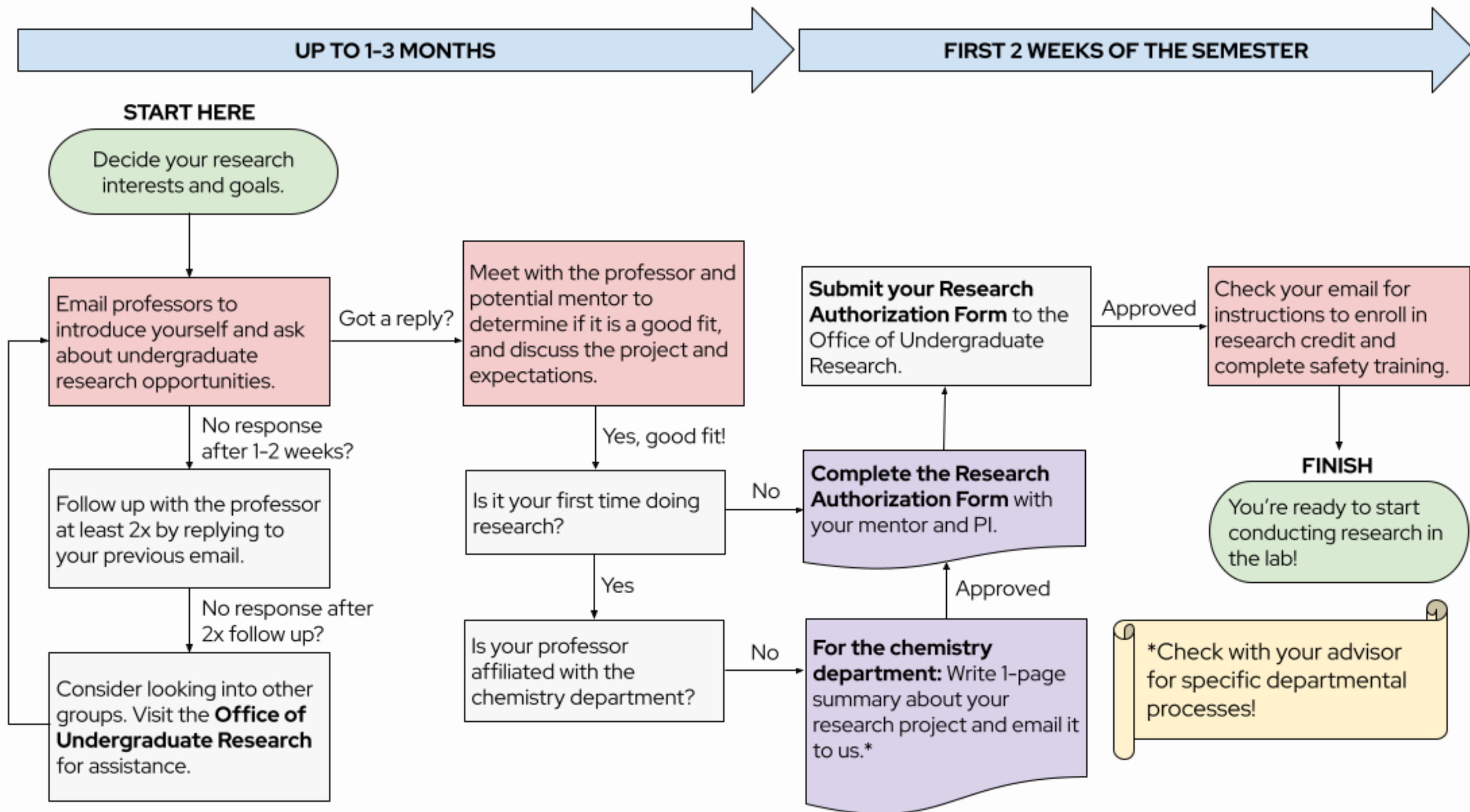
03

Volunteer

04

Summer Research Experiences for Undergraduates (REUs)

How to Get Started



How to Get Started



START HERE

Decide your research
interests and goals.



Identify Your Interests

1. Decide what type of research you want to do
 - a. Specific skills to gain?
 - b. Contribute to a broader impact? Interdisciplinary?
2. Identify potential faculty to contact
 - a. Talk to your professors, TAs, and other students to see what opportunities are available
 - b. Look on departmental websites or through Wisconsin Discovery Portal

Start early! This process can take at least 1 month or more.

Chemical Biology

Research at the interface of chemistry and biology

Inorganic

Research involving metals and materials (catalysis, materials, metallo-enzymes)

Chemical Ed.

Study of teaching and learning chemistry

Analytical

Quantitative methods and instrumentation

Physical

Using physics to study chemical systems

Materials

Synthesis, properties, and/or utility analysis of materials

Organic

Synthesis of organic materials, study of properties and mechanisms

Theoretical

Study of chemical systems using math, physics, and computer science

Chemical Biology Faculty



Helen Blackwell

Norman C. Craig Professor of Chemistry, Associate Chair for the Graduate Program, Director of Graduate Studies
blackwell@chem.wisc.edu

[Blackwell Group Research Website](#)



Eszter Boros

Associate Professor
eboros@wisc.edu

Eszter Boros obtained her B.Sc. (2006) and her M.Sc. (2007) at the University of Zurich and her Ph.D. (2011) in Chemistry from the University of British Columbia. She was a postdoctoral fellow (2011-2015) and later...



Thomas Brunold

Professor of Chemistry
brunold@chem.wisc.edu

[Brunold Group Research Website](#)



Andrew R. Buller

Assistant Professor of Chemistry
arbuller@wisc.edu

[Buller Group Research Website](#)



Judith N. Burstyn

Professor of Chemistry
burstyn@chem.wisc.edu

[Burstyn Group Research Website](#)



Silvia Cavagnero

Professor of Chemistry
cavagnero@chem.wisc.edu

[Cavagnero Group Research Website](#)



Joshua J. Coon

Professor of Biomolecular Chemistry and Chemistry
jcoon@chem.wisc.edu

[Coon Group Research Website](#)



Katrina Forest

Professor of Bacteriology and Chemistry
forest@bact.wisc.edu

[Forest Group Research Website](#)



Helen Blackwell

Norman C. Craig Professor of Chemistry, Associate Chair for the Graduate Program, Director of Graduate Studies

blackwell@chem.wisc.edu

608.262.1503

Room 5211A, Department of Chemistry
1101 University Avenue,
Madison, WI 53706



Research Website

[Blackwell Group](#)

Research Interests

Bioorganic, Biopolymers & Biopolymer Mimics, Functional Materials, Quantitative Biology, Synthesis

EDUCATION

1994 – B.A. Oberlin College

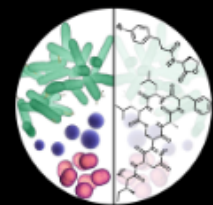
1999 – Ph.D. California Institute of Technology

1999-2002 – Postdoctoral Fellow at Harvard University

VIEW PUBLICATIONS

RESEARCH DESCRIPTION

Organic chemistry is in the unique position to provide molecular level insights into biological processes. Renewed appreciation for the power of small molecules as tools to explore living systems has fueled an explosion of interest in chemical biology. Within this broad context, our research program is focused on the development of new synthetic methodology to expedite the discovery of biologically active molecules. We are strategically combining elements of microwave-assisted organic chemistry, solid-phase synthesis, and combinatorial chemistry to provide access to new classes of chemical probes. In turn, we are applying these small molecule tools to bacterial communication and host/microbe interactions, previously unexamined areas of chemical biology. We seek to understand how both plants and animals sense and respond to invasion by pathogenic microbes. The ability of bacteria to communicate with each other and function as a group is a critical step in the development of infectious disease. The reliance of bacteria on a language of small molecules places organic chemists in a unique position to discover the fundamental principles underlying this communication network and design tools to modulate it at the molecular level.



See Publications for published research articles.

Want to know more?

We recommend the following reviews by our group as a great starting point:

Quorum Sensing

[2016 Review](#) – Chemical probes of quorum sensing: from compound development to biological discovery

[2010 Review](#) – Small Molecules That Modulate Quorum Sensing and Control Virulence in *Pseudomonas aeruginosa*.



[2008 Review](#) – Expanding Dialogues: From Natural Autoinducers to Non-Natural Analogues that Modulate Quorum Sensing in Gram-Negative Bacteria.

[Spot Synthesis](#)

Research Overview

For an overview of Helen's thoughts on quorum sensing and our lab's work, check out [this article](#) from UW-Madison's College of Letters and Science's magazine!

We are devising novel chemical tools to decode and interfere with bacterial communication pathways. There is a growing appreciation that bacteria communicate with each other using chemical signals. An imperative to understand these bacterial conversations arises from their roles in both pathogenic and symbiotic processes. At high cell densities, bacteria use these chemical signals (or autoinducers) to switch from a nomadic existence to that of multicellular community in a process referred to as "quorum sensing" (QS; see Fig. 1). This lifestyle switch is significant. Numerous pathogenic bacteria use QS to turn on virulence pathways and form communities called biofilms that are resistant to antibiotics. In contrast, various symbiotic bacteria use QS to commence beneficial relationships with their hosts. To initiate these diverse and important processes, bacteria use a chemical language of low molecular weight organic compounds. **We recognized that we could use synthetic chemistry to intercept and redirect these bacterial conversations by creating our own small molecule languages.** Using novel synthesis methods, my research group has generated a suite of synthetic ligands that selectively inhibit or activate QS processes. These compounds are active in wild-type bacteria on their native hosts and are amongst the most potent QS modulators known.

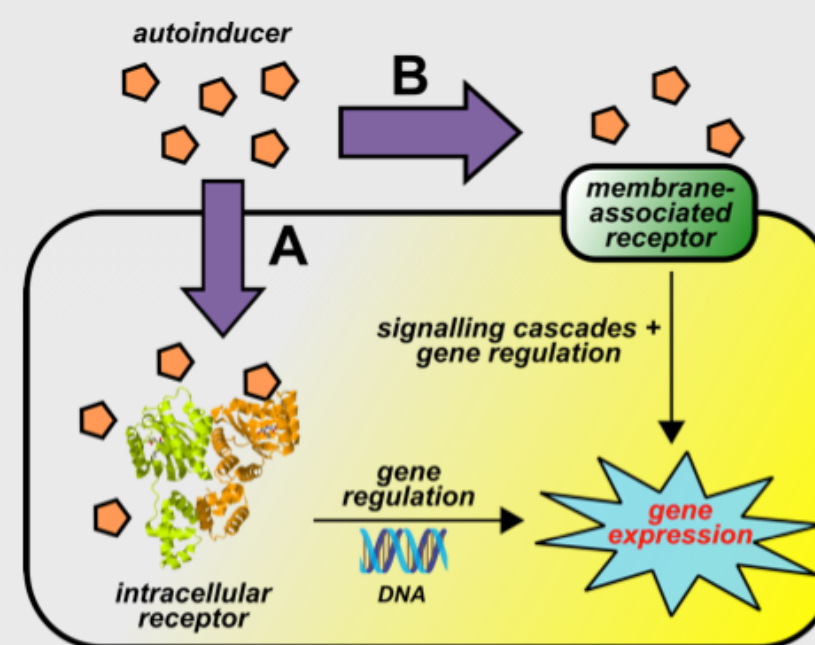


Figure 1. Schematic of the QS process in bacteria. Pentagons represent autoinducer signals. A. LuxR/LuxI-type QS in Gram-negative bacteria (such as *P. aeruginosa*). B. QS system in many Gram-positive bacteria (such as the agr system in *S. aureus*). Graphic modified from: *Org. Biomol. Chem.* 2012, 10, 8189-8199.

DISCOVERYPORTAL.ORG



RESEARCH AT UW-MADISON

Search UW-Madison Scholars

Research Topic



Show UW-Madison Academic Units

Research at a Glance

Research activities for UW-Madison faculty over the past 36 months.



22,769



ARTICLES

1,415



CONFERENCE PROCEEDINGS

\$1.5B



GRANTS

3,427



GRANTS

394



AWARDS



Articles

View More

Search Results for "up cycling"

Terms Related to Your Search

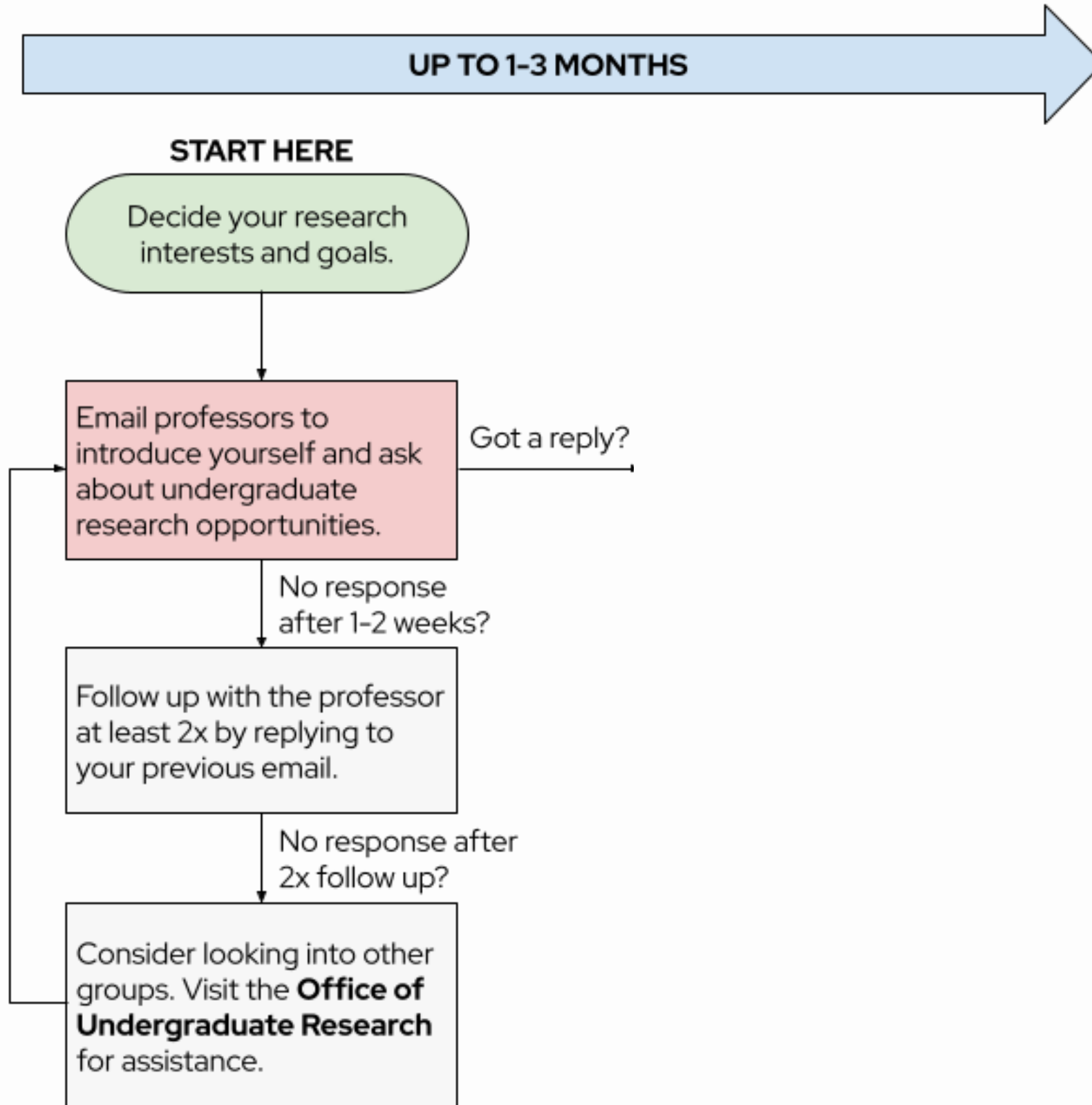
- upflow anaerobic sludge blanket reactor
- upgrading
- upper atmosphere
- upper stage rocket engines
- upper surface blowing
- upper surface blown flaps
- upstream
- upwelling water
- upwind schemes (mathematics)
- Ares 1 upper stage
- Acetylcysteine
- acoustic sounding
- aerodynamic characteristics
- aeronomy
- air currents
- aircraft configurations

Scholars

Expand

	Related Works	Related Networks
BARBARA KLEIN Ophthalmology and Visual Sciences	121	57
DAVID BLUEMKE Radiology	111	1
BRAD ASTOR Medicine	87	22
JANE S PAULSEN Neurology	29	1

How to Get Started





Land the Right Opportunity

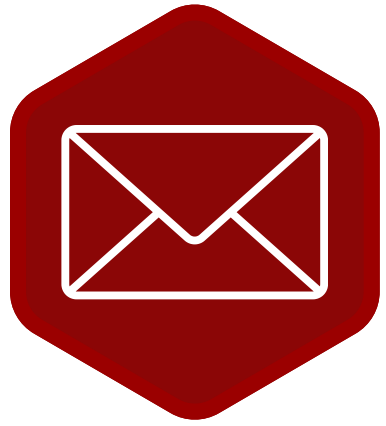
1. Contact professors
 - a. Talk to them in-person if you're in their class
 - b. Cold-email them
 - c. Respond to ads for undergrad research positions
2. If no response after 1-2 weeks, send a follow-up email by replying to the previous email.
3. Stop by their office, if possible.



Desired Applicant Qualities*

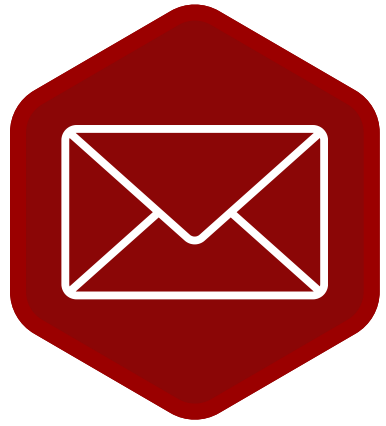
*This is a general list, that can differ per group. You can also ask directly!

- Show initiative by reaching out to faculty
- Curious about the research topic
- Willing to learn new things and from mistakes/failures
- Responsible – ex. show up on time, do what you say you will do, and follow lab safety and procedures
- Patient – research takes time, scientific results and skill development are not always immediate
- Can commit **at least 1 year** to do research
- No minimum GPA, BUT being a student comes first



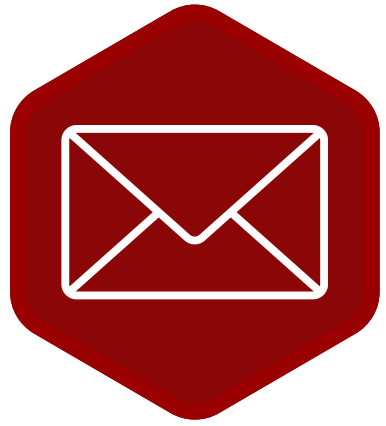
Sending an Email

- **Introduce yourself:** "Hello Professor [NAME], My name is _____."
- **State your purpose:** "I am planning to go to grad school in chemistry and am looking to gain some research experience in a lab before I apply."
- **Give some background about your experience:** "I'm a sophomore chemistry major with an overall GPA of 3.4, and a chemistry GPA of 3.8. I have taken 103/104 and am currently enrolled in 311 and 343."



Sending an Email

- **Introduce yourself:** "Hello Professor [NAME], My name is _____."
- **State your purpose:** "I am planning to go to grad school in chemistry and am looking to gain some research experience in a lab before I apply."
- **Give some background about your experience:** "I'm a sophomore chemistry major with an overall GPA of 3.4, and a chemistry GPA of 3.8. I have taken 103/104 and am currently enrolled in 311 and 343."
- **Talk about your interests:** "I've always been interested in polymers and would really like to understand their environmental impact."
- **List a specific project from the group that you're interested in:** "I saw on your website that you were conducting research with biodegradable co-polymers and would love to learn more about this project."



Sending an Email

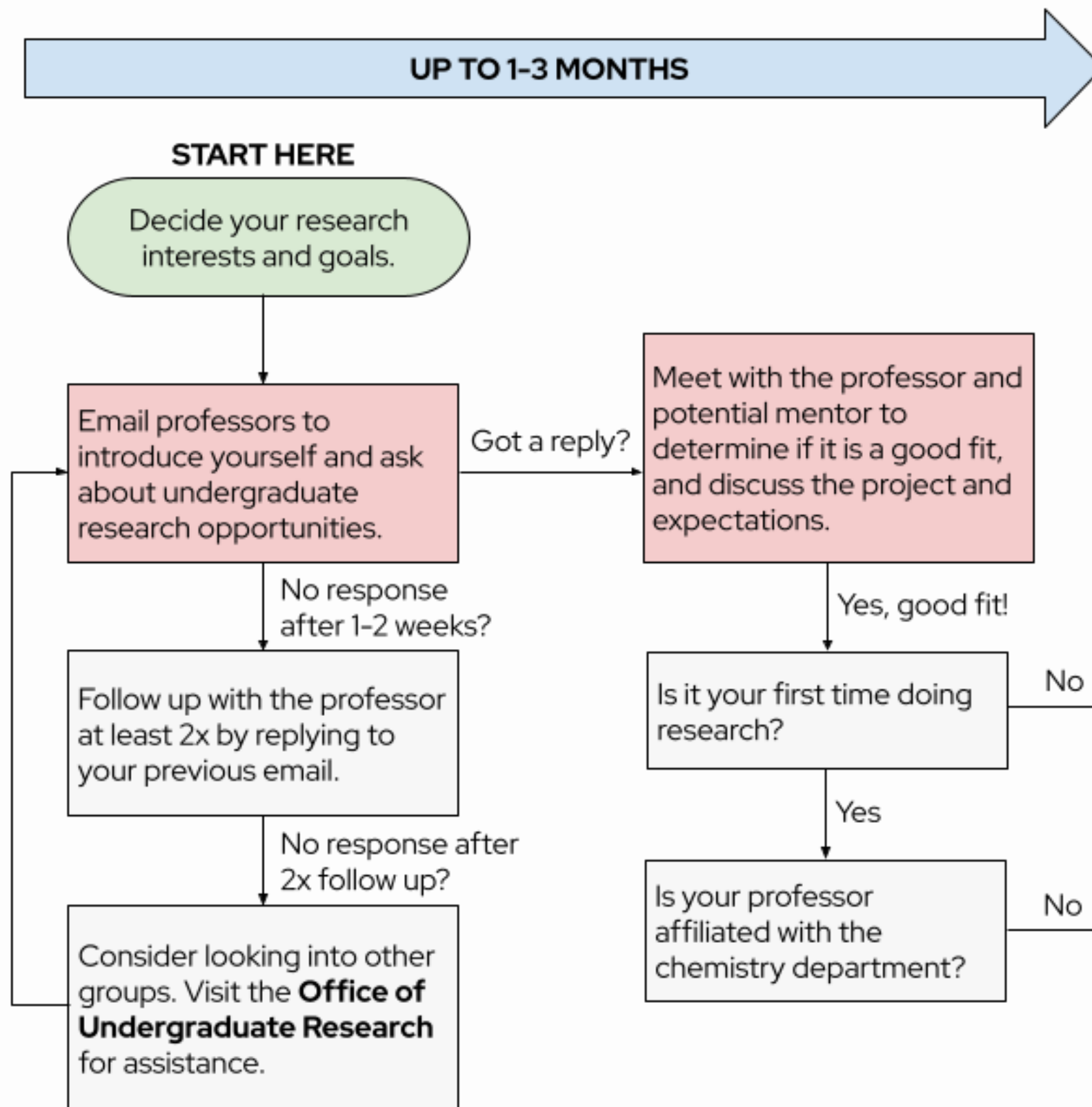
- **Introduce yourself:** "Hello Professor [NAME], My name is _____."
- **State your purpose:** "I am planning to go to grad school in chemistry and am looking to gain some research experience in a lab before I apply."
- **Give some background about your experience:** "I'm a sophomore chemistry major with an overall GPA of 3.4, and a chemistry GPA of 3.8. I have taken 103/104 and am currently enrolled in 311 and 343."
- **Talk about your interests:** "I've always been interested in polymers and would really like to understand their environmental impact."
- **List a specific project from the group that you're interested in:** "I saw on your website that you were conducting research with biodegradable co-polymers and would love to learn more about this project."
- **Ask if they are taking students:** "Are there any opportunities for undergraduate researchers this semester?"
- **Ask to set-up an appointment:** "If so, may I set-up an appointment to further discuss your research and this opportunity?"
- **Say Thanks:** "Thank you for your time. I look forward to hearing back from you."



Sending an Email

- **Introduce yourself:** "Hello Professor [NAME], My name is _____."
- **State your purpose:** "I am planning to go to grad school in chemistry and am looking to gain some research experience in a lab before I apply."
- **Give some background about your experience:** "I'm a sophomore chemistry major with an overall GPA of 3.4, and a chemistry GPA of 3.8. I have taken 103/104 and am currently enrolled in 311 and 343."
- **Talk about your interests:** "I've always been interested in polymers and would really like to understand their environmental impact."
- **List a specific project from the group that you're interested in:** "I saw on your website that you were conducting research with biodegradable co-polymers and would love to learn more about this project."
- **Ask if they are taking students:** "Are there any opportunities for undergraduate researchers this semester?"
- **Ask to set-up an appointment:** "If so, may I set-up an appointment to further discuss your research and this opportunity?"
- **Say Thanks:** "Thank you for your time. I look forward to hearing back from you."

How to Get Started





Preparing for the Interview

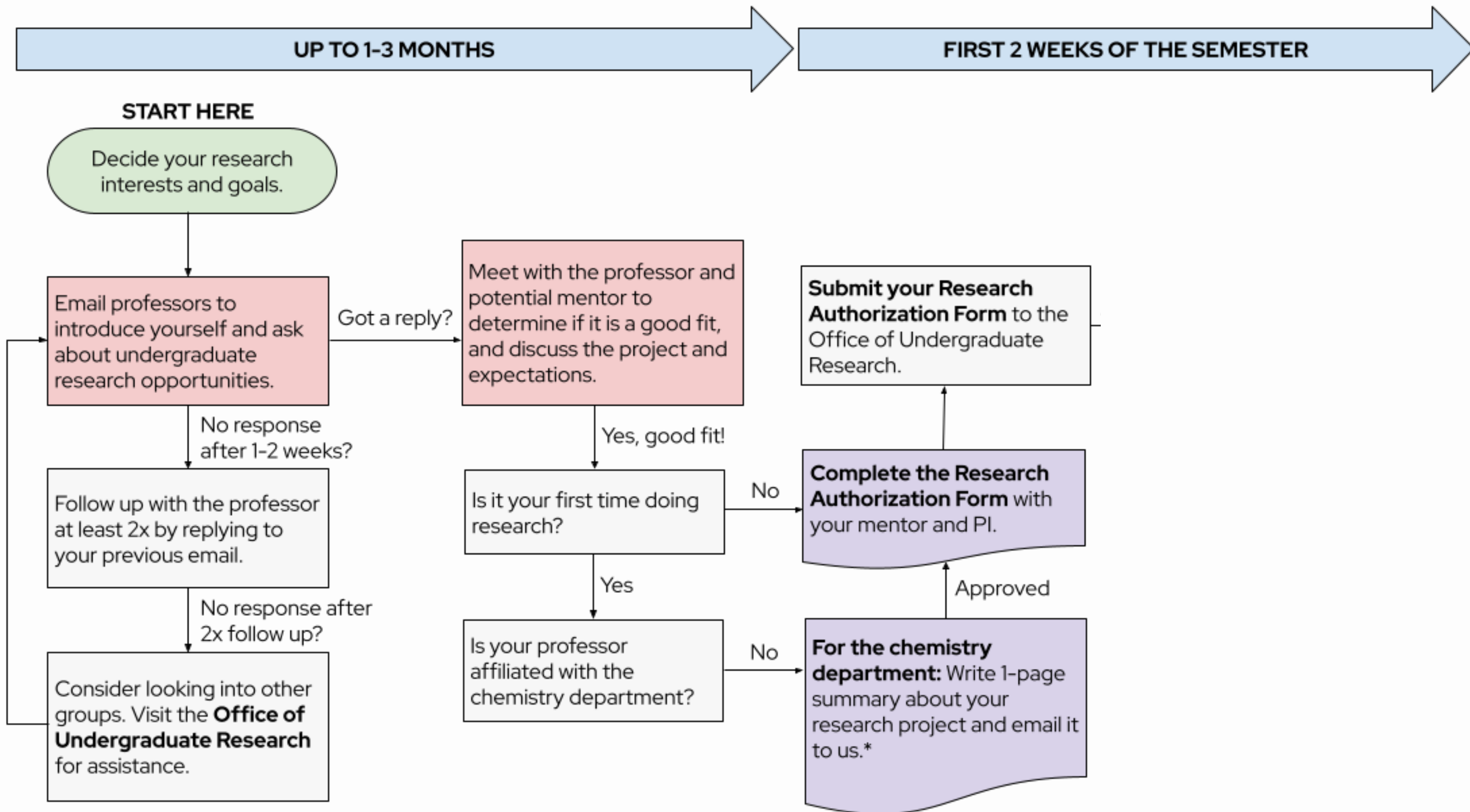
- Why do you want to do research with their group?
- What do you hope to gain from conducting undergraduate research?
- How many hours do you plan to commit to research per week? (*At least 3-9?*)
- How many semesters do you plan to stay in the lab? (*At least 2?*)
- Prepare at least 1-2 questions (either about the group, the research, expectations, etc.)
 - What other activities are undergrads expected to participate in?
 - What type of work do undergrads typically do?
 - What is the training/mentorship process like? Who will be my direct mentor?
 - Can I see some of the lab spaces or get a sneak peek of the type of work that I would do?



Frequently Asked Questions

- Do we need prior experience to do undergrad research?
 - No, but it is important to be curious, hard-working, and organized!
- Do we have to cold-email?
 - Yes, if you want to connect with a professor that you currently do not have a connection with.
- What are other methods to contact professors?
 - Start networking with other people to see if they may know them and can introduce you to them.
- What are some classes that will be useful or helpful for research?
 - CHEM 260 Entering Research may be offered for Fall 2024.

How to Get Started



Research Authorization Form

[Submit Your Research Authorization Form](#)

Complete the Research Authorization Form

Fall, Spring, and Summer Semester Research Authorization Form

Deadline for Spring 2024: February 2, 2024

[Undergraduate Chemistry Research Authorization Form \(Word\)](#)

[Undergraduate Chemistry Research Authorization Form \(Adobe PDF\)](#)

Winter Research Authorization Form

For any research activity between December 14, 2023-January 23, 2024 (end of fall term to start of spring term)

[Undergraduate Chemistry Research Authorization Form Winter \(Word\)](#)

[Undergraduate Chemistry Research Authorization Form Winter \(Adobe PDF\)](#)

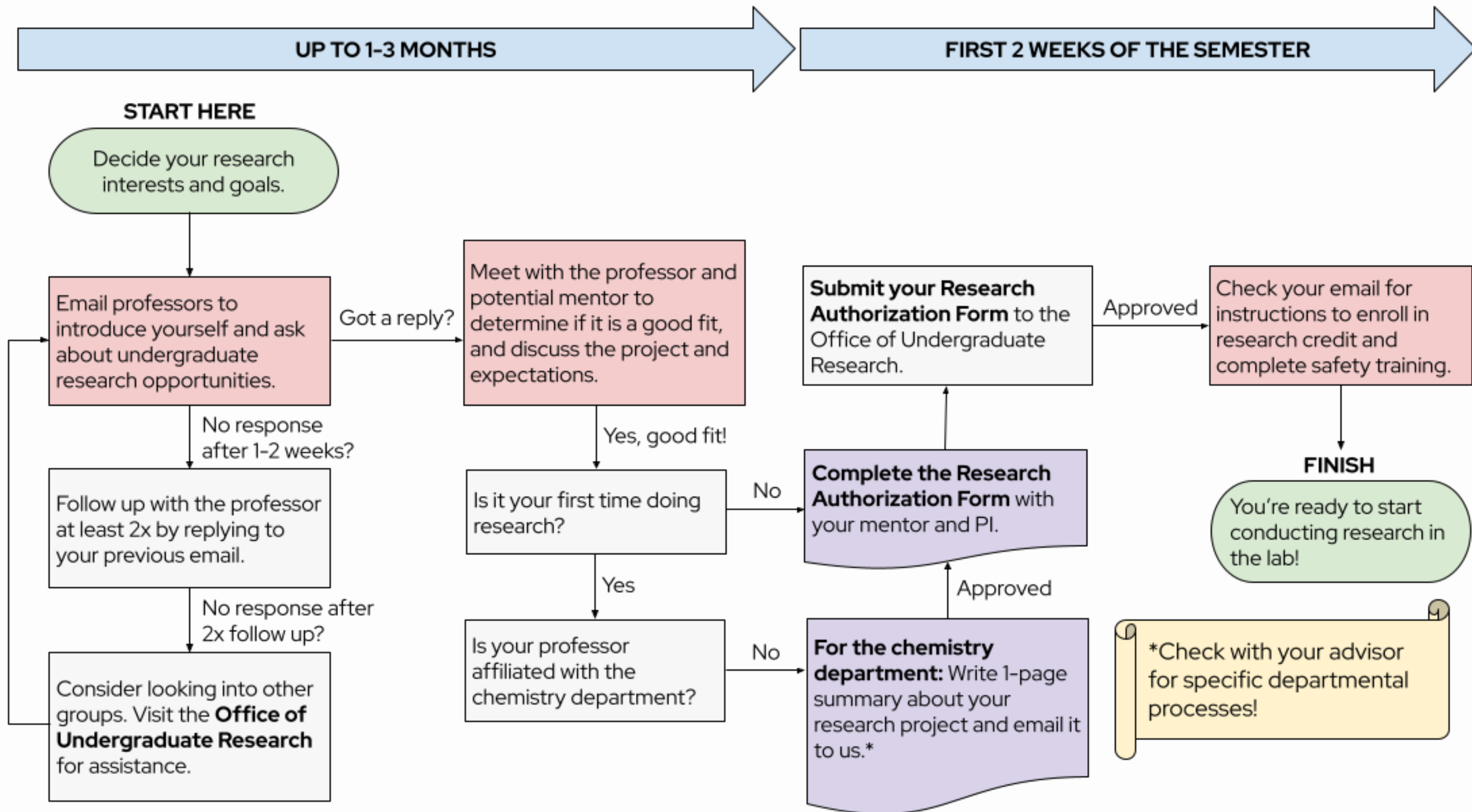
Course Credits Breakdown

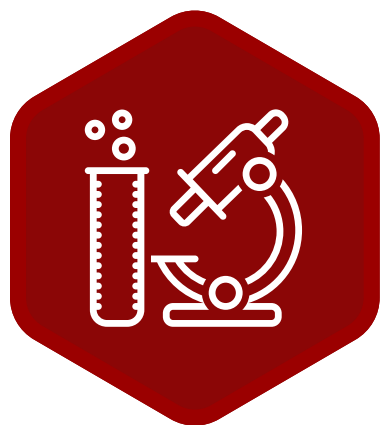
1 credit hour = 3-4 hours of research per week = 45-60 hours per semester

Most students do **2-3 credit hours = 6-12 hours of research per week**

Less than 54 total credits AND your first semester of research?	CHEM 299 (1-4 credits)
More than 54 total credits OR returning researcher?	CHEM 699 (1-6 credits)
Senior Honors Thesis?	CHEM 681/682 (2-6 credits)
Senior Thesis?	CHEM 691/692 (2-6 credits)

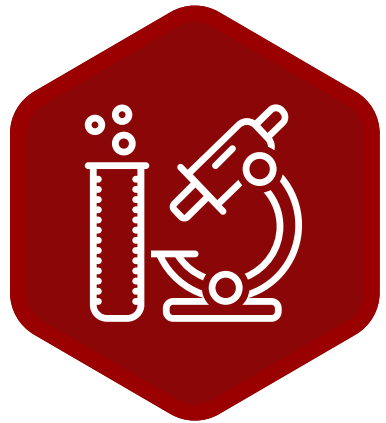
How to Get Started





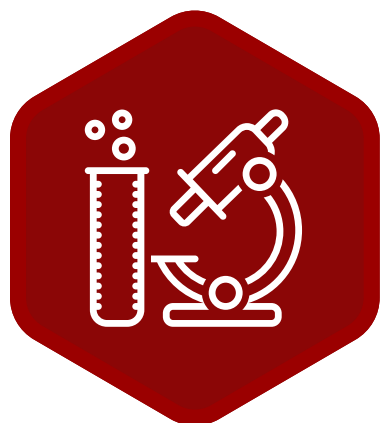
Start Research

- Work with your mentor
 - Discuss the project, set goals and mutual expectations.
 - Meet regularly to discuss your research progress.
 - Work safely in the lab, with your mentor's supervision
- **Reach out to the Chemistry Undergraduate Research office if you are experiencing challenges with your research.**
- Connect with other students in the undergrad research community, such as the Chemistry Undergraduate Research Board (CURB).
- Apply for research opportunities, scholarships, graduate school, etc.
- Present your research, attend conferences, write a thesis, etc.



Tips for Undergrad Research

- **Time blocking:** Scheduling weekly research hours depends on you, your mentor, and the project's needs. Generally, a few 2-4 hour blocks for research per week are recommended, as 1-hour gaps are not usually sufficient for doing extensive lab work. Use Google calendar to keep track.
- **Take opportunities to present results:** Present to group meetings, poster presentations, etc. Publications are rare for undergrads, as projects can take longer than the time that you are in the lab.
- **Advocate for your goals and needs:** Communicate with your mentor, PI, etc about what you want to gain from the experience and follow your action plan to accomplish it. Leverage university resources and network.



Summer Research Opportunities

- aka REU, SROP, SURE, SURF
- Opportunity to do paid research at another university
- Applications usually open in November and due by early February
- Needs a letter of recommendation!
- Somewhat competitive, but still worth applying to

Summer Research Opportunities at UW-Madison

[Expand all](#) | [Collapse all](#)

+ Summer Research Opportunity Program (SROP)

+ American Chemical Society (ACS)

+ Hildale-Holstrom Research Fellowship

+ Sophomore Research Fellowship

Summer Research Opportunities at Other Campuses/National Labs

[Expand all](#) | [Collapse all](#)

+ Programs in the Medical Sciences

+ AMGEN Scholars Program

+ DOE Internships

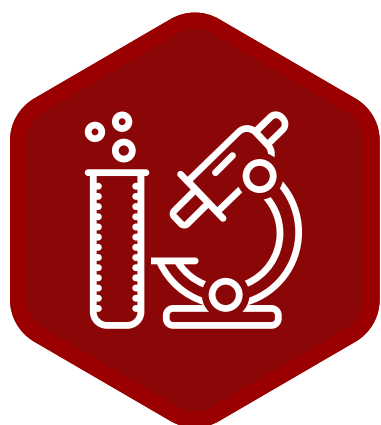
+ National Labs

+ Pathways to Science

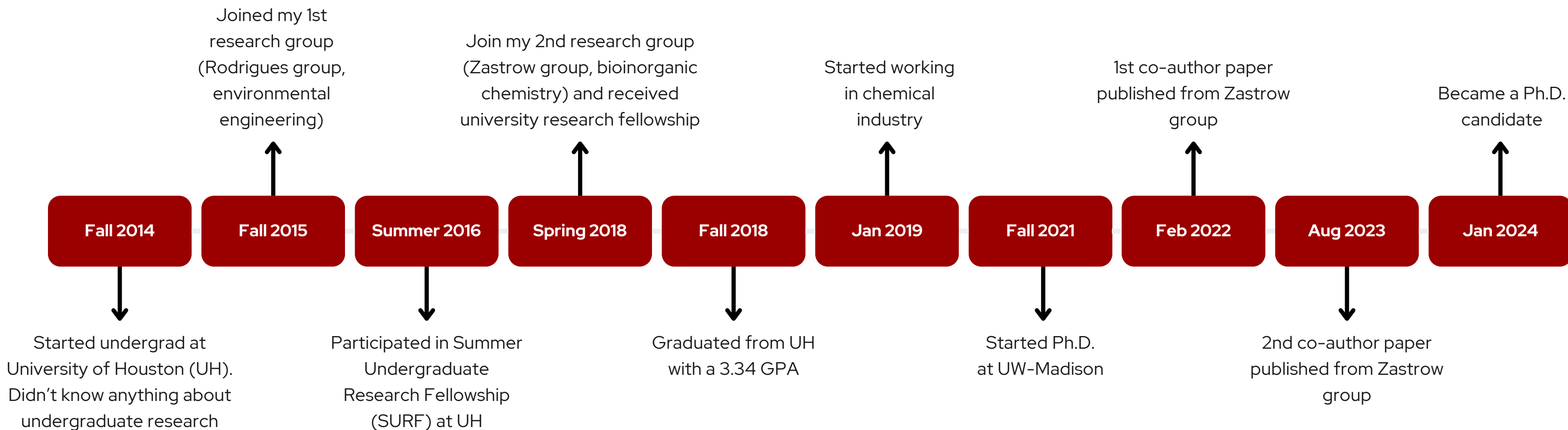
+ Summer Research Opportunities at Big Ten institutions

+ Research Experience for Undergraduates (REU)

+ National Science Foundation (NSF)



Brittany's Research Journey



Chemistry Undergraduate Research Board (CURB) Panelists

1. Victoria Tholkes, Biochemistry
2. Elizabeth Schnorrenberg, Inorganic Chemistry
3. Brendan Prosser, Chemical Biology
4. Hunter Coplien, Organic Chemistry

Join 2024-25 CURB!

- Improve and expand opportunities for undergraduate researchers
- Build community amongst undergraduate researchers
- Become a leader in the chemistry department

Apply to be a part of CURB by April 1 at 11:59PM
Scan QR code for the application



CHEMISTAY GAME NIGHT

Hosted by CURB, USCA, and Chem Ambassadors

When: March 14th from 5:00–6:00 pm

Where: Learning Studio, RM 1435



VIDEO GAMES,
BOARD GAMES,
AND FREE
PIZZA!

Contact the Chemistry Undergraduate Research Office

Brittany Trinh, Undergraduate Research TA
Office Hours: Weds 1-4pm and Thurs 9am-12pm



chem_ugr_research@chem.wisc.edu



<https://undergradresearch.chem.wisc.edu/>



Chemistry North Tower, 7408