

Fall 2025 Syllabus for CHEM 715: Issues at the Chemistry-Biology Interface (CBI)

Meyerhoff 120
Mondays, 4:00 PM – 6:00 PM
1 credit
Instructor: Prof. Aaron T. Smith

General information

The Fall 2025 version of CHEM 715 is a didactic course that brings together all trainees in the CBI program, that covers important advancements in the CBI field, the discusses ethical topics facing researchers at the Chemistry-Biology interface, and provides opportunities for CBI trainees to improve their scientific communication skills. The course is 1 credit and meets every Monday from 4:00 PM – 6:00 PM in Meyerhoff 120 of the UMBC Chemistry and Biochemistry building and, once a month, in the 6th floor conference room of the UMB School of Pharmacy. The goal of this course is to increase the knowledge of all CBI trainees in cutting-edge research at the chemistry-biology interface, to discuss important ethical topics among CBI trainees, to improve the scientific communication skills of all CBI trainees, and to build a rapport amongst the trainees participating in the CBI program.

Requirements

First year CBI trainees are "on probation" while they complete their rotations, join a research group, and take classes. At the end of their 1st academic year participating in the CBI program, applicants submit an application package for consideration for full membership in the CBI program. If the trainee has maintained a good GPA (> 3.25), joined an appropriate research group, and has a research project appropriate to the CBI (see comments below), the trainee will be officially accepted into the CBI program. Once admitted to the program, the trainee must complete the required elements listed below to maintain membership in the program:

1. Take an upper-level course in one of the other disciplines (this cannot be a course in their same Department and **must be approved by Dr. Smith and Dr. Fletcher**)
2. Take an NIH-approved ethics course (offered in all three Departments once a year)
3. Maintain a 3.25 or better GPA in all coursework
4. Present at two or more of the local and/or regional graduate symposiums each year, as well as additional regional, national, and international meetings as appropriate (note: NIH-funded CBI Fellows must present at least two national or international meeting each year as a requirement of their fellowship)
5. Participate in a research training opportunity with someone in another Department (or even in another University) that gives added value to the trainee's dissertation project. **The training opportunity must be approved by Dr. Smith and Dr. Fletcher in consultation with the trainee's mentor.**
6. Attend and participate in all CBI activities each semester
7. Continue to make appropriate progress towards degree completion (*i.e.*, finish all milestones as required by each department on time).

Information regarding how to apply/re-apply to the CBI program is detailed on the CBI website:

<https://cbi.umbc.edu>

If a trainee fails to (i) make academic progress, (ii) fulfill the CBI requirements, (iii) maintain a >3.25 GPA for more than one semester, or (iv) transfers to a Master's degree program, the trainee must exit CBI. Each trainee is reviewed every year to ensure they are meeting all the requirements and are on track academically.

Mentors: If a trainee joins a group where the faculty member is not yet a member, the faculty must apply to the program. Not all faculty members are appropriate for membership in CBI and, unless they are a new faculty, they must have a strong track record of obtaining funding, publishing, and mentoring trainees. In addition, the trainee's Ph.D. research **MUST** be at the CBI, and it must have elements that involve cross-disciplinary science. CBI trainees should also have at least one member of the CBI training faculty on their committee from another Department. Ideally, if possible, the external member of the trainee's committee should be the person with whom they are doing their cross training. However, depending on the timing, it may not be possible, so this is not a strict requirement

Course Structure, Attendance, and Homework

CHEM 715 meets Mondays from 4-6 pm in room 120 of the Meyerhoff Chemistry and Biochemistry building and, once a month, in the 6th floor conference room of the UMB School of Pharmacy. In the Fall of 2025, groups of full members of the CBI program will lead discussions on *either* **Emerging Topics and Techniques Relevant to CBI Research** or **Ethical Issues Relating to Emerging Topics and Techniques Relevant to CBI Research**.

Attendance: CBI members are allowed no more than two (2) ***excused absences*** from CHEM 715 in the Fall 2025 semester. Excused absences must be cleared with Dr. Smith and Dr. Fletcher ahead of time, except when illness occurs unexpectedly. Importantly: ***everyone is expected to be in attendance for the external speakers AND for the CBI meetings downtown at the School of Pharmacy.***

Cell phones and laptops should be put away during all presentations!

Google Drive Folder link: (for uploading papers and questions; please copy, paste, and rename the template folder each week with the name of the topic and include PDFs of the papers and a PDF of the questions for the homework)

<https://drive.google.com/drive/folders/1hUAFnsGWCZK3Bk3SMQnYjQsulECIm5Bd?usp=sharing>

Emerging Topics and Techniques Relevant to CBI Research: At least one (1) week prior to a group's presentation, please upload two (2) major articles that highlight the emerging topic and/or technique on the selected list. These should be articles from primary literature (journals such as *Cell*, *Science*, *JACS*, etc.) that you upload to the accessible Google Drive. In addition, you should supply approximately 5-6 questions for everyone to answer. These questions

should be straight-forward and reasonable to answer in 1-3 sentences assuming the articles have been read.

In your presentation, your group should:

- Provide an introduction, background, and a general overview of the emerging topic/technique (What is it? What key principles underlie the technique? When was it developed? What are the general applications? In other words, what is the required information needed for someone in CBI to know about how the technique works?) **(10-15 minutes)**
- Walk the CBI trainees through the science presented and the important conclusions of the two (2) major publications on the emerging topic/technique, as well as pose questions to the CBI trainees that stimulate discussion on the papers. Additionally, include any limitations you find of the major works. Be sure to synopsise as necessary; do not walk through every single experiment and data point in each paper! **(30-40 minutes)**
- Contextualize the technique in its broader field highlight what you see to be the long-term applications, limits, and potential hurdles that the technique may face **(10-15 minutes)**

Ethical Issues Relating to Emerging Topics and Techniques Relevant to CBI Research: At least one (1) week prior to a group's presentation, please upload at least one (1) journal article and at least one (1) popular media article (e.g., from the New York Times, Chicago Tribune, BBC, or News & Views articles from journals such as *Science*, *Nature*, *C&E News* etc.) on the ethical topic at hand to the accessible Google Drive. Please keep the articles to a reasonable length. In addition, you should supply approximately 5-6 questions for everyone else to answer. These questions should be straight-forward and reasonable to answer in 1-3 sentences assuming the articles have been read.

In your presentation, your group should:

- Walk the CBI trainees through the ethical situation(s) outlined in the publications **(20 minutes)**
- Explain the long-term ethical implications and pose questions to the CBI trainees that stimulate discussion regarding the ethical implications of the topic at hand focused on the science presented and not personal opinions **(20 minutes)**
- Weigh the pros and the cons of the ethical topic at hand, and explain the popular media article to the CBI trainees and present whether or not the popular media article accurately portrays the ethical conundrum **(20 minutes)**

In total, all presentations should last no more than 60 minutes, including Q&A sessions!

Homework questions: Every individual who is not presenting must complete and turn in answers to the homework questions posed every week unless you have an excused absence. The questions will be collected in person at the beginning of class after attendance is taken. CHEM 715 is a Pass/Fail course; if you do not complete your homework questions, you will not pass CHEM 715, which will delay your Ph.D. progression, will prohibit your continuation in CBI, and will prevent your use of CBI funds for travel and cross-training.

The homework questions should be straight-forward for your fellow classmates to answer, assuming that they have read the assigned literature. However, when presenting, your group should use these questions as “jumping off” points for discussion. For example:

HW question: “What was the major type of new chemical transformation observed in the Student *et. al.* paper published in *Science* in 1986?”

Discussion question: “What kinds/class of new molecules were now available thanks to the reaction developed in the Student *et. al.* paper published in *Science* in 1986? What is one major location in your everyday life in which these kinds of molecules have made an impact? Do you think this chemical modification was worthy of being published in *Science*, or does it seem trivial by today’s standards?”

CBI 3MT Presentations: In addition, 2-3 times per week, upper-level ($\geq 3^{\text{rd}}$ -year) CBI trainees will deliver a “3-minute thesis” talk utilizing a single slide and no more than 3 minutes total (***you will be timed so please practice!***). Oral feedback will be given to all 3MT presenters, and prizes for the best 3MT and most-improved 3MT will be given at the CBI Holiday Party!

Pizza time: After presentations are finished, we will have an additional 45 minutes to eat dinner and to discuss topics of interest relevant to the program. While the CBI fellows generally run these discussion sessions, ****anyone**** may suggest and run a pizza-time discussion as long as they clear the topic with Dr. Smith, Dr. Fletcher, and the fellows first.

External speakers: As part of CHEM 715, the trainees also invite notable outside speakers to visit the program and campus and to give a talk. During those visits, the CBI trainees are responsible for planning the itinerary. Only CBI trainees meet with the visitor; however, all faculty and trainees are invited to attend the talk.

CBI downtown: As CHEM 715 is a multi-campus course, we will have CBI meetings downtown at the School of Pharmacy approximately once per month. Attendance is required at the downtown meetings. Parking passes will be available for those who choose to drive, and carpooling is encouraged. The CBI fellows will work to help arrange carpooling. The MTA bus as well as the UMBC shuttle also drop off downtown and may be used as alternative transportation means.

Travel funding and fellowships

Once a trainee is officially accepted into the CBI program, they are eligible for funds for travel and supplies to support their cross training. **All requests for travel and cross training funds must be approved by Dr. Smith and Dr. Fletcher in advance, and each trainee**

should cc their adviser and their appropriate funding pre-approver. Information can be found on the CBI website to this effect:

<https://cbi.umbc.edu/requesting-usage-of-cbi-funds/>

Fall 2025 schedule

- Sept 1** – NO CBI (Labor Day)
- Sept 8** – Group and topic: Sean O’Sullivan, Jeanne Ngo, Michael Marciniak (Organoids and Novel Model Systems)
– 3MT presenters: Nav Raj Phulara, Vanshika Patel, Ayo Ogunsanya
– **Pizza: Kyle**
- Sept 15** – Group and topic: Meagan Bauer, Vaibhav Ginoya, Nimalee Jayasekera (Biosensors)
– 3MT presenters: Hedyeh Zamani
– **Pizza: Jeanne**
- Sept 22** – External speaker: Prof. Andrew D. Hamilton, President Emeritus of NYU (**attendance required**)
– **Pizza: Michael**
- Sept 29** – (Hosted at UMB; **attendance required**)
– Group and topic: Sazia Arefin Kachi, Sarah Pogash, Agbo-oma Uwakweh (AI in medical diagnostics)
– 3MT presenters: Agbo-oma Uwakweh, Sazia Arefin Kachi
- Oct 6** – Group and topic: Nav Raj Phulara, Joshua Miguele Camacho, Kushani Mendis, Oliver Paszkowski (Science communication in the age of misinformation)
– 3MT presenters: Nimalee Jayasekera, Meagan Bauer
– **Pizza: Sarah**
- Oct 13** – Group and topic: Alex Chin, Hedyeh Zamani, Fidelia Asomani (Gene therapy: theory and practical applications)
– 3MT presenters: Candice Armstrong, Hasan Al Banna, Manju Ojha
– **Pizza: Sean**

- Oct 20** – (Hosted at UMB; **attendance required**)
- Group and topic: Vanshika Patel, Vincent Lowe, Kieran Johnson (Vaccine hesitancy and mRNA vaccines)
- 3MT presenters: Vincent Lowe, Sean O’Sullivan
- Oct 27** – Group and topic: Kyle Davis, Trisha De Jesus, and Bethel Beyene (AI in research and drug design)
- 3MT presenters: Durga Devkota, Fidelia Asomani, Leopoldo Posada Escobar
- **Pizza: Vanshika**
- Nov 3** External speaker: Dr. Marissa Locke Rottinghaus, Editorial Content Manager for ASBMB and ASBMB Today (**attendance required**)
- **Pizza: Kyle**
- Nov 10** – Group and topic: Candice Armstrong, Hasan Al Banna, Manju Ojha (mRNA therapeutics)
- 3MT presenters: Bijaya B K, Michael Marciniak
- **Pizza: Jeanne**
- Nov 17** – Open topics for discussion
- **Pizza: Michael**
- Nov 24** – NO CBI (week of Thanksgiving)
- Dec 1** – (Hosted at UMB; **attendance required**);
- Group and topic: Codi Hrynko, Durga Devkota, Leopoldo Posada Escobar (Nanomaterials and nanomedicine)
- 3MT presenters: Kyle Davis, Trisha De Jesus, Rajat Jha
- Dec 8** – Group and topic: Bijaya BK, Prashanta Sharma Roy and Rajat Jha (Targeted protein degraders, such as PROTACs and RIPTACS)
- 3MT presenters: Prashanta Sharma Roy, Kushani Mendis, Vaibhav Ginoya
- **Pizza: Sarah**
- Dec 15`** – CBI Holiday Party