Chemistry Comps 2014-2015

The 2014-2015 Chemistry Comps program begins with this document. Here we outline the timelines and options for successful completion of chemistry comps. The comps coordinator for the year is Dave Alberg.

Some Important Points

- There are two options for comps: (1) the Group Option and (2) the Individual Paper Option. For the Group Option, one comps group will work fall/winter, the other three groups will work winter/spring. The individual paper allows more flexibility in the timing of your comps, see below. You will submit a proposal indicating your choice by **8:00am, Monday, May 19** (you will know the outcome before the registration period).
- Special circumstances may limit your choice (and timing) of comps project, such as intent to graduate early, off-campus study during the senior year, your status as a double major, etc. **Of special note:** you **must** be a registered student (minimum of 12 credits) while you are doing comps. For paper writers, this means you **must be registered the term you complete your comps.** For Group Comps, **you must be registered the terms your group is scheduled to work.** For instance, if you intend to complete your course work by the end of the winter term next year, than an individual paper **must** be completed at the end of winter term, as well. In the case of Group Comps, you **may not** join a winter/spring comps group if you plan **not** to enroll in classes next spring.
- It is expected that all comps students will attend all comps-related talks (given by students and visitors) as part of your work in comps. **Attendance is a requirement – plan accordingly!**

Special Opportunity for Seniors: Global Engagement Initiative Senior Research Teams.
Although not directly connected to Comps, in connection with Carleton’s Global Engagement Initiative, there is a new opportunity for seniors to become involved in an interdisciplinary team research project to be conducted over the course of the senior year. See the final pages of this document for details.

Option I: The Individual Paper

There are two versions of the Individual Paper. The first involves a literature topic of your choosing, while the second version is an option for those who have done research and want to write a paper that expands on that research. The Individual Paper involves considerable independent work at all stages, including becoming familiar with the primary literature of your topic. Typical papers might have 5-10 primary literature articles that you have analyzed in great detail. The paper is not merely a library report but is designed to involve you in the topic as a critical scientist. Personal judgments, criticisms, and suggestions for future directions will play important roles in creating an excellent paper. Expect that the paper will go through multiple revisions, and a lot of work is still necessary after the completion of the first draft. Typically, you will meet weekly with your advisor until the paper is complete.

**Literature-topic Individual Paper.** Those of you choosing this option will select a topic of personal interest on which you will write a paper of **20 to 30 pages in length** (with an absolute limit of 40 pages, which includes all figures, illustrations, footnotes, endnotes, references, acknowledgements, etc.). Most importantly, you must find a faculty advisor who agrees to work with you. You may consult with any of the faculty for advice about selecting a topic and advisor.

**Research-type Individual Paper.** This option is available to those who have been involved in a research project either at Carleton or elsewhere. It is intended to provide an opportunity for you to **extend** the scope of your necessarily limited laboratory work to a broader perspective, quite like that of the "Literature-topic Individual Paper" option. The Research Paper is not just a very large lab report. It requires that you explore in depth, a topic that you have become familiar with through your research, incorporating your work into the larger picture.
Formal Requirements for Individual Papers

1. **Proposal**, due by 8:00am, Monday, May 19 via email to Dave Alberg: For paper writers, the “proposal” is simply a statement of the paper topic and a signature (or mail) from a chemistry faculty member to the comps director, indicating that he or she has agreed to serve as your advisor on the paper. Your potential advisor will have to approve of your topic and may require you to flesh out your proposal before agreeing to work with you.

2. **Weekly meetings.** You and your advisor will arrange a regular weekly meeting time to discuss your topic and to monitor your progress.

3. **The second reader.** One other faculty member must read your paper. You should think about whom this second reader should be (with advice from your advisor) and select him or her early in the process. After the project has been outlined and has some focus, you should plan to meet with the two faculty readers, so that both are familiar with your plan and topic. The second reader should be provided with drafts of your paper-in-progress on a schedule you have arranged with your advisor.

4. **The oral defense.** Your project will conclude with a 45 to 60 minute closed discussion with your two faculty advisors and will cover the material discussed in your paper. You also have the option of presenting a public seminar on your topic (30 minutes is a reasonable timeframe for your talk). If you do choose to give a general public talk, then you will also have the choice on whether to include the public talk as part of the evaluation in Comps. Please talk to your advisor about how to make these choices.

5. After completing your defense, you will make any final revisions of your paper and then archive this final draft at the library digital archive web site (https://comps.carleton.edu/comps/). Instructions for archiving are available on the web site.

Registration Instructions:
Register for CHEM 400.01 (credits per term to be determined in consultation with your advisor).

Two Timelines for Completing Individual Papers

Two timelines for completing the Individual Paper comps option are outlined below and on the next page. The typical schedule is a winter/spring combination, with the bulk of the work occurring in the winter term (4 credits) and the remainder in the spring term (2 credits). A fall/winter combination is also possible, but you will need to move more quickly, so that you are ready to dig in at the beginning of Fall term. With either schedule, there are several milestones for each comps option that must be achieved in order for you to be considered to be making adequate progress towards completing comps. These non-negotiable deadlines are outlined with boxes in the timelines. If you do not meet these expectations, the department may require you to fulfill the comps requirement through other means (such as taking and passing a set of comprehensive exams).

**WINTER-SPRING COMPS (the standard schedule):**

**Fall term and winter break:**

- Finalize the outline of your intended topic with your advisor before the registration period for Winter term.
- Schedule specific times for winter term weekly meetings with advisor.
- Gather interesting papers from the library’s paper, electronic journal collections, and Interlibrary Loan (ILL).
- Read papers.

**Winter term:**

- Read papers in depth.
- Refine topic and create outline.
- Expand outline and identify topics about which more needs to be learned.
- Start to expand the outline with text (intro, etc.).
- Assemble a first draft.
- Week 9: Submit a reasonably complete draft with figures, bibliography, etc. to advisor.
- Week 10: Discuss the draft with your advisor and identify areas for more work.
Spring Term:

- Week 1: Schedule date for oral defense with advisor and second reader.
- Revise!
- Weeks 4-5: Defendable draft is due at least one week before your defense date.
- Week 6: Oral defense must take place before the end of this week.
- Weeks 7-8: Submit two clean, bound copies of your final draft to Wendy Zimmerman as well as electronically to the library.

FALL-WINTER COMPS (the alternate schedule):

Spring term (of year before starting comps) and summer break:

- Determine topic and advisor. Advisor must be determined by the May 19th.
- Schedule regular meetings with your advisor before registering for Fall classes.
- Gather interesting papers from the library’s paper and electronic journal collections as well as Interlibrary Loan (ILL).

Fall term and winter break:

- Read papers in depth.
- Refine topic and create outline.
- Expand outline and identify topics about which more needs to be learned.
- Start to expand the outline with text (e.g. introductory and background material).
- Submit a reasonably complete first draft on or before the last day of class fall term.
- Schedule winter term meetings with advisor (before the end of fall term).

Winter Term:

- Week 1: Submit a complete draft with figures, bibliography, etc. to advisor.
- Week 2: Meet with advisor to discuss draft; schedule date for oral defense with advisor and second reader.
- Revise!
- Weeks 6-7: Defendable draft is due at least one week before your defense date.
- Week 8: Oral defense must take place before the end of this week.
- Week 9: Submit two clean, bound copies of your final draft to Wendy Zimmerman, as well as electronically to the library.

Option II: The Group Discussion (“Group Comps”)

In this Comps option, groups averaging five to eight students meet with one or two faculty members for in-depth discussions on specific topics from the recent scientific literature. Groups typically form around one scientist’s research. The projects usually culminate with two important events: (1) a public seminar prepared and delivered by the comps group, followed by (2) a campus visit by the comps “subject” for lengthy discussions with group. The date for the comps student seminar will be set by the department by the beginning of Fall term. The details as they are currently known for the specific groups forming for next year are given on p. 5-6.

In spite of being the most popular option, joining a comps group is not for everyone. You must commit to participating at every meeting and to working on your own and with other group members outside of the regular meetings. Comps must take a high priority among your various activities. Group Comps is not a good option if you have other inflexible commitments on your time or if you prefer working and learning on your own. Under these circumstances, it would be better to opt for an Individual Paper.

Comps groups meet at set times during the term. The winter/spring groups meet during period 5A in the winter term, with additional meetings (to be determined by the group) during spring term. The fall/winter group will meet during the 2.3C period next fall, with additional meetings (to be determined by the group) during winter term. Students in a group will decide on the direction of the readings, the discussion topics, and the nature of the written and oral assignments during the term. The faculty advisor is meant to be a facilitator who, if things succeed, will remain in the background and will be a discussion peer. Each member is required to participate actively. Active participation includes keeping up with reading assignments selected by the group, preparing presentations or handouts on various topics for the group, actively engaging in discussion and decision-making at each meeting, as well as other assignments (e.g. discussion summaries, short papers, preparing the public seminar, and supplemental library work).
The Group Option proposal, due by 8:00am, Monday, May 19, via email to Dave Alberg: Your selection to Group Comps is based on a carefully prepared typed statement concerning your motivation for doing group comps. Your proposal should convince the faculty of your commitment to be an active group member. Provide any evidence you can offer indicating that you possess the ability and determination to be a fully active participant throughout the process. Also, your past record as a chemistry major and “citizen” of the chemistry department will be considered in the selection process. Participation in a group is not assured. The department reserves the right NOT to select a student for Group Comps if we are not convinced that the student will contribute to the process in an active and positive manner. Be aware that selection to Group Comps is made by the entire department and is decided before the particular group assignments are made. In your proposal, no discussion of the specific science of any of the group topics should be included. This is a statement of your intent, desire, and ability to participate in a student-motivated, group-learning endeavor. This need not be a lengthy statement and should be kept to no more than one page of text.

Important: At the end of your proposal, you should indicate your preference for specific comps groups. Please indicate your group preferences by ranking them from 1-4. Feel free to provide information about how strongly you feel about your preferences. If you would be equally happy to join either of two or more groups, say so. We will strive to place you in either your first or second choice group. Keep in mind that the group sizes need to be reasonably balanced. Once you are assigned to a group, it will not be possible to switch groups.

Departmental Policy on Earning Distinction in Comps
As a preamble to comments about the department’s policy on distinction, please keep in mind that distinction in comps does not really matter much when it comes to your future plans. Whether your plans include joining the work force, graduate school, medical school, or a service or volunteer job, distinction in comps will have little impact. What matters most is your overall record at Carleton and your recommendation letters. In fact, many decisions about your future may be made before anyone knows who got distinction. Nonetheless, you may decide to make it a personal goal to strive for distinction, and we support this goal.

Distinction in Comps is a difficult issue for chemistry majors and faculty, particularly with our department’s Group Comps option. This issue is less sticky if you do an individual paper involving library work or research. Since a Individual paper is an individual effort, a comps advisor who sees a quality paper and oral presentation can more easily recognize and recommend distinction. In the group format, however, these decisions may not be as clear cut. Of course, distinction in group comps, like distinction on an individual paper, requires an unusual understanding of the material and the demonstrated ability to communicate your knowledge and understanding to others. The group experience particularly focuses on communication. Some attributes which make a group work well include cooperation, collaboration, teaching, listening, planning together, and celebrating achievements of understanding or, in other words, being a good colleague. Some of these characteristics, in some circumstances, may be odds with the attributes that could lead to individual accomplishment. In addition, faculty advisors do not always have a complete understanding of how the group truly operates, especially as the group becomes more independent and does a lot of work outside of the scheduled meeting times. In this case, a student who is perhaps less verbal during discussions with the faculty member but is actually the "backbone" of the group outside the formal discussions may be overlooked by the advisor when deciding whom to recommend for distinction. These complications in awarding distinction to members of a discussion group tend to lead to fewer distinctions compared to individual options.

To achieve distinction in comps, whether it be for work done in a discussion group or an individual project, keep in mind the following sage advice of an esteemed retired faculty member: A lot of hard work does not distinction make. In other words, creativity, synthesis, unusual understanding, presentation of new proposals, and integration of disciplines are some of the hallmarks of an outstanding comps effort. Students who get distinction are often not trying for distinction; instead they are just interested in learning due to their own intellectual satisfaction. A faculty member can recognize when these qualities are coming together to create an outstanding comps product. If a comps advisor sees these qualities in your project he or she will recommend you to the department for distinction in comps. A discussion of all the candidates for distinction will follow in a department meeting until a consensus is reached.

If you have decided to set the personal goal of achieving distinction on your comps, please talk to us and especially to your comps advisor to get a better feeling as to how we think about distinction. We are certainly happy to discuss this topic with you now so that there will be no misunderstandings at the end of the comps process next spring.

Group Topics for Chemistry Comps, 2014-2015
Fall/Winter Group:

1. The Global Atmospheric Carbon Cycle – led by Will Hollingsworth
   Visiting Scientist TBA.
   Dates of Visit: TBA (winter term)

The global carbon cycle has been out of balance since the start of the industrial revolution due to fossil-fuel combustion. It is now clear that the sustained increase in trace gases is behind marked change over all spatial scales, from local and regional air quality to global climate. This comps group will focus on one of several related research areas based on which scientist will be coming to campus. The area of focus will likely be studying the fate of organic intermediates resulting from fuel combustion or deciphering the puzzle of how changing fluxes of carbon dioxide and methane yield a greater understanding into possible biogeochemical responses to the imbalance.

This group will be run in the fall and the winter with a 4:2 split for credit. The fall sessions will meet weekly during the 2,3c time period in Olin 103. The group will meet once weekly during the first half of the winter term planning for the presentation as well as the scientist’s visit soon after midterm break.

Registration Instructions:
Fall Term, register for 4 credits of CHEM 400.05
Winter Term, register for 2 credits of CHEM 400.05

Winter/Spring Groups

2. Ultrafast Spectroscopic Techniques for the Study of Biomolecules and Materials – led by Deborah Gross and Dani Kohen
   Visiting Scientist: Martin Zanni, Department of Chemistry, University of Wisconsin, Madison
   Research Website: http://zanni.chem.wisc.edu/
   Dates of Visit: April 23-24, 2015

From Zanni’s website: Research in the Zanni group is aimed at exploring molecular structures and dynamics through vibrational motions and couplings. To accomplish this, sophisticated ultrafast multi-dimensional spectroscopies are being developed that correlate vibrational modes and measure frequency fluctuations. Emphasis is placed on understanding the molecular vibrations of complex biomolecules or materials to monitor their structures, dynamics and function. Our comps group will work to understand the fundamental techniques used by the Zanni group in one or more application areas, determined by the group’s areas of interest.

Registration Instructions:
Winter Term, register for 5 credits of CHEM 400, section (TBA)
Spring Term, register for 1 credits of CHEM 400, section (TBA)

3. Biosynthetic Enzymology – led by Chris Calderone
   Scientist: Christopher T. Walsh, Harvard Medical School
   Research Website: http://walsh.med.harvard.edu
   Dates of visit: May 7-8, 2015

Christopher T. Walsh is one of the premier enzymologists in the world; over his three-decade career he has been on the faculties of MIT and Harvard Medical School as well as served as the president of the Dana-Farber Cancer Institute in Boston. He has published over 600 papers and written three books, including "Enzymatic Reaction Mechanisms," which essentially reinvented the field of mechanistic enzymology for generations of biochemists. His most recent research (which we will focus on) has been directed toward understanding the biochemical pathways involved in the production of complex small molecules by bacteria and fungi, the modes of action of antibiotics, and the biochemical mechanisms of bacterial antibiotic resistance.

Registration Instructions:
Winter Term, register for 5 credits of CHEM 400, section (TBA)
Spring Term, register for 1 credits of CHEM 400, section (TBA)
Research Website: http://hx2.med.upenn.edu
Dates of Visit: April 16-17, 2015

Dr. Englander's laboratory is interested in biophysical studies of protein structure, function, folding, misfolding, and amyloids. They use a range of protein biophysical techniques including NMR, chemical and spectroscopic approaches, analytical ultracentrifugation, electron microscopy, mass spectrometry, and mutational analysis. The laboratory is particularly well known for the development and use of hydrogen exchange (HX) approaches, in which deuterium exchange is monitored by NMR or mass spectrometry. HX measurements provide data are sensitive to structure, structure change, internal dynamics, energy, and functional interactions at identifiable positions throughout all macromolecules, and have provided remarkable insights about protein folding pathways and stability.

Registration Instructions:
Winter Term, register for 5 credits of CHEM 400, section (TBA)
Spring Term, register for 1 credits of CHEM 400, section (TBA)

Special Opportunity for Seniors: Global Engagement Initiative Senior Research Teams.
As mentioned on the first page of this document, there is a new opportunity at Carleton for seniors to become involved in an extended interdisciplinary team research project. Political Science Professor Al Montero is directing this project. Below is a letter from Professor Montero that outlines the project and provides information about what you can do if you would like more information and/or would like to apply.

Letter from Professor Montero:

Dear Current Juniors/Rising Senior Majors,

I am writing to you as part of my efforts to recruit qualified students for a brand new opportunity that is being made available to just a few departments next year. As you know, Carleton was awarded a very large grant from the Mellon Foundation to support our current Global Engagement Initiative (GEI). I have been a part of the GEI since it first started among a small group of enthusiastic faculty three years ago. Presently, I am responsible for assembling the GEI’s first ever Senior Research Teams. It is this program that I write to you about now.

GEI Senior Research Teams are for students who are attracted to the idea of doing a sustained, collaborative research project during their senior year but who also wish to do their comps separately in their major departments. In this program, the collective project exists parallel to and separate from the individual comps project, but it may be informed by each student’s expertise and comps experience. The research teams may consult with their home departments for advice on particular ideas but the teams are expected to operate independently of the departments. I will serve as a coordinator for these teams, facilitating meetings, organizing deadlines, overseeing and reporting on the progress of the teams to the consulting departments as needed, and making available any core advising to the teams in periodic meetings during the research period. These projects, depending on their duration will earn no fewer than 6 credits and could earn more.

The GEI steering committee and a number of departments who have recruited their majors for this have agreed to focus next year’s senior research teams on the broad topic of public health. You may know that I am offering a seminar on Global Public Health in the fall, so this is very much a topic I feel I can support in my efforts to coordinate team-based research. We expect the projects to start in the winter of next year and finish in the spring with a highly visible event in which the research teams will present their findings. My task this term is to recruit interested juniors and to help assemble the teams, but the teams themselves will develop on their own specific research questions and produce the work rather independently of their home departments. Thus far, I have received notice from majors in biology, sociology, music, chemistry, and CAMS. I have slots available for political science.
The GEI Senior Research Teams concept offers tremendous challenges and large rewards. In addition to the academic credit, students’ letters of recommendation will be able to speak of the extraordinary efforts made by participants to overcome the challenges posed by interdisciplinary and collaborative work. These are core skills and experiences that are highly demanded by employers and they will serve graduates extremely well in a range of pursuits beyond Carleton. What is being proposed here is truly unique. Comps is the capstone at Carleton, beyond which we do not offer any additional opportunities for some students – albeit the most self-motivated and energetic – to develop and demonstrate their skills in high-level interdisciplinary, global, and collaborative research. The GEI research team concept goes beyond the regular comps to create an intellectual challenge that should test some of the very best Carleton students during their senior year.

Entry into these challenging and prestigious programs requires first this invitation and then an application. If you are interested in pursuing this opportunity, simply contact me (amontero) as soon as possible. I hope to invite a selection of students to a meeting later this term that goes into greater detail on the GEI Senior Research Teams concept.

I hope several of you become genuinely interested in this challenging new opportunity during the senior year.

Very best wishes,

Al Montero

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OFFICE HOURS DURING THE SPRING TERM: TUESDAYS 9 A.M.-10:30 A.M.; WEDNESDAYS 10 A.M.-12 P.M.; ADDITIONALLY BY APPOINTMENT ON SKYPE ON THURSDAY EVENINGS