

# Chemistry Comps 2009-2010

October 7, 2009

Comps Director: Steven Drew

This is the updated version of the 2009-2010 senior Comps document. This document includes a timeline for applying for a comps option, an outline of the two options available (the Long Paper and Group Discussion), and a cover page to include with your comps application/proposal.

## Timeline

Date	Deadline
Wednesday, October 21	Comps application/proposal due. See the Comps Proposal Cover Page at the end of this document for directions.
Friday, October 30	Comps group assignments and registration information emailed to seniors
Monday, November 2	Senior course registration for winter term

## Some Important Points

- Chemistry comps consumes more than a single term of work; since the bulk of the work usually takes place in the first term, it is normal to register for five credits the first term and one credit the second term. This credit distribution may be different if you opt for an unusual schedule; communicate with your advisor about distributing credits in a reasonable way.
  - ‡ Group comps is only offered winter/spring and therefore is only an option for students planning to be enrolled during both those terms of the senior year. **Group comps will meet during period 5A winter term.**
  - ‡ The long paper is normally completed on a winter/spring schedule. **In order to follow the unusual fall/winter schedule, a student must petition the department before the last day of class in the spring term before starting comps.** Timelines and required milestones in these schedules are outlined under Option I: The Long Paper.
- Special circumstances that will impact your ability to do group comps are: intent to graduate early (such as finishing a term), off-campus study plans, multiple comps projects (such as a double major), and conflict with other courses needed during period 5A of winter term.
- For either option, you must submit a comps proposal to the comps coordinator during the term *before* you plan to start work on your comps. The proposal deadline for the winter/spring schedule is midterm break of fall term. If you petition for a fall/winter schedule, you must submit your proposal and petition to the department before the last day of class in the spring term before you start comps.
- If you will be off campus during fall term, it is important that you set up procedures for us to contact you while you are away. You can work this out with your advisor or the chemistry comps coordinator.
- It is expected that you will attend all comps-related chemistry talks (given by students and visitors) as part of your work in comps.
- **For all comps options, there are several milestones that must be achieved in order for you to be considered to be making adequate progress towards completing comps. If you do not meet these expectations, the department may require you to fulfill the comps requirement through another form (such as a set of comprehensive exams).**

## **Option I: The Long Paper**

Two versions of the Long Paper are possible. The first involves a literature topic of your choosing, while the second would be available to those who have done research and want to write a paper that includes and expands on that research.

**Literature Topic Long 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). You must submit a proposal to the department on your topic and you must also find a faculty advisor, with whom you will work closely. If you would like to begin work this coming fall, you need to identify your faculty mentor and submit a proposal to the comps coordinator *before you leave for the summer*. If you elect to do Comps in the winter, the proposal deadline will be around midterm of fall term; *watch for the announcement in the Weekly Beaker*. *A long paper proposal should include 1-2 pages of text on the proposed topic with 2 attached original articles from the literature*. You also need a formal statement from your mentor indicating that he/she has agreed to work with you. You can consult with any of us in the selection of your mentor.

This option involves considerable library work in 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 an important role in an excellent paper. The paper will go through several revisions. Given how busy everyone gets at Carleton, it is crucial to treat this as a formal commitment, to start it early and schedule regular times during the week to make progress. *Please be aware that unusual comps paper topics (i.e. topics that are not covered in the mainstream chemistry literature) will be considered, but they will require extra independent effort on your part and possibly a longer overall timeframe to make them work.*

### **Formal Requirements:**

1. *Weekly meeting.* You and your advisor will schedule a meeting time each week to discuss your topic and to monitor your progress.
2. *The second reader.* One other faculty member must read your paper. You should think about whom this second reader should be and select (with advice from your primary mentor) your second reader 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 the same schedule as you have arranged with your advisor.
3. *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 once your project has started about how to make these choices.
4. After the completion of your closed discussion you will have three copies of your final draft bound (Central Services) and provide one copy to the Department Office, and one copy to each of your readers.

**The Research Long Paper.** This option is available to those of you who have been or are presently involved in research projects. It is intended to provide an opportunity for you to *extend* the scope of your necessarily limited laboratory accomplishments to a broader perspective, quite like that of the "Literature Topic Long Paper" option. The requirements and structure of the experience of the "Research Paper" are the same as for the "Literature Topic Paper". This is also true of the proposal you are required to submit (see above).

The Research Long Paper is not a huge lab report. It is a research paper, utilizing the literature and laboratory work to explore a topic, part of which you have become familiar with through your research. The paper resulting from this option is also presented for discussion with two faculty members early in Spring Term as described above for the "Long Paper" option. In addition, you also have the option of presenting a general public seminar, as described above.

**Paper-writing Timelines:** Two timelines for completing the Long Paper version of comps are outlined below. The first is a winter/spring combination, which is the standard process with the bulk of the work occurring in the winter term (5 credits) and the remainder in the spring term (1 credit). **The fall/winter combination, which distributes the work more equally between the two terms (usually 3 credits each) is unusual and you must petition the department by the last day of class in the spring term prior to starting comps to request this schedule.** Your petition should state your reasons for pursuing the unusual schedule. In either process, the non-negotiable deadlines are outlined with boxes; otherwise, you may have some flexibility in completing the other tasks associated with writing your paper, as determined in your meetings with your paper advisor.

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

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**Fall term and winter break:**

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| <ul style="list-style-type: none"> <li>• Determine topic and advisor before midterm break</li> <li>• Submit your comps proposal before midterm break</li> <li>• Schedule winter term meetings with advisor (before the end of fall term)</li> </ul> |
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- Obtain relevant papers
  - Request interesting papers from 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.

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| <ul style="list-style-type: none"> <li>• Week 9: Submit complete draft with figures, bibliography, etc. to advisor</li> <li>• Week 10: Discuss complete draft with advisor and identify areas for more work</li> </ul> |
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**Spring Term:**

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| <ul style="list-style-type: none"> <li>• Week 1: Schedule date for oral defense with advisor and second reader.</li> <li>• Revise!</li> </ul> |
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| <ul style="list-style-type: none"> <li>• Weeks 4-5: Defendable draft due at least one week before your defense date.</li> <li>• Week 6: Oral defense must take place before the end of this week.</li> <li>• Weeks 7-9: Submit two clean, bound copies of your final draft to Wendy Zimmerman.</li> </ul> |
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**FALL-WINTER COMPS (the unusual schedule):**

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

- Determine topic and advisor.
- Submit your comps proposal and petition the department for this schedule (before the last day of class in spring term).
- Obtain relevant papers
- Request interesting papers from ILL
- Read papers

**Fall term and winter break:**

- Week 1: Schedule regular meetings with your advisor.
- 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.)
- Submit a 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 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.

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

In this Comps experience, groups of approximately four to seven students meet with one or two faculty members for in-depth discussions on specific topics from the recent scientific literature. Groups meet three times a week during period 5A in the winter term, and additional meetings are required during the early part of the spring as well. The 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 a departmental seminar, supplemental library work, etc.). The groups typically form around one scientist’s research, and the project often culminates with that person visiting campus and having lengthy discussions with group members, or with the Comps group visiting the campus and research group of the scientist whose work was studied.

This option, the most popular in recent years, is not for everyone. You must be willing to make a full contribution to the group and Comps must take a high priority among your various activities. Undoubtedly, you will have to find time outside of the regular weekly meetings to work with other group members. Group Comps is probably 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 a Long Paper. *Also, you must be enrolled in the college during both the winter and spring terms. If you plan to complete your course work at the end of winter term you cannot do Group Comps.* The Group option can be a very educational way to do Comps, but it does require lots of effort by all members of the group for success. The Long Paper is a suitable option for a more individualized Comps experience.

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. Selection to Group Comps will be based on your proposal, which is the vehicle for you to express your interest and convince us of your commitment. Your past record as a chemistry major and “citizen” of the chemistry department will also be considered. Be aware that selection to Group Comps is made by the department and is decided before the particular group assignments are made.

The Group Option proposal is a carefully prepared typed statement concerning your motivation for doing group comps. Provide any evidence you can offer indicating that you possess the ability and determination to be a *fully active participant* throughout the process. 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. You should also indicate any group preferences you may have, in your proposal. When possible, we will try to accommodate your group preferences.

**Please note that Group Comps will meet during winter term at period 5a.** Take this into consideration when making your decisions about Comps, and during registration for your other winter classes. Finally, if you are selected to the group, you will be required to attend a meeting with your advisor near the end of fall term, where expectations for group members are made clear.

### **Group Comps Topics:**

#### **Group 1: Steven Drew**

***Subject: Interfacial chemistry***  
***Chemist: Geri Richmond, Univ. of Oregon***

Geri Richmond's research group studies the central role that surfaces play in many chemical and physical processes. Her work is relevant to such diverse areas as aerosol chemistry in the atmosphere, transport of oxygen across lipid surfactant monolayers, polymerization catalysis at solid surfaces, and chemical separations across the interface of two immiscible liquids typical in HPLC. Prof. Richmond's laboratory uses laser spectroscopic techniques as well as computational methods to probe interfacial systems. More information can be found at Geri Richmond's research Web site: <http://richmondscience.uoregon.edu/>. Prof. Richmond will be visiting Carleton on April 29-30.

#### **Group 2: Marion Cass**

***Subject: Coordination Chemistry***  
***Chemist: Ken Raymond, UC Berkeley***

I am thrilled that Professor Ken Raymond from the University of California, Berkeley will be one of our comps speakers next year and has arranged to visit Carleton on April 22 and 23. Ken has several active areas of research within his group that range from the study of naturally occurring iron chelating agents to chelating agents that selectively bind actinides or lanthanides. This winter, I will plan to work with a group of seniors to study Ken's work on the design and synthesis of highly symmetric inorganic clusters that can encapsulate reactants, creating a special pocket (much like that generated in the active site of a protein) where reactions can take place in a controlled chemical environment. This

portion of Ken's work he refers to as "supramolecular chemistry". See Supramolecular chemistry under the following link: <http://www.cchem.berkeley.edu/knrgroup/research.html>.

**Group 3: Joe Chihade and Deborah Gross***Subject: Proteomics**Scientist: Benjamin Cravatt**The Scripps Research Institute*

Proteomics is a relatively new field that takes advantage of recent advances in both analytical chemistry and in genome sequencing. The goal of proteomics experiments is to find out how the proteins present in an organism, and the relative quantities of those proteins, change as the organism experiences different conditions. Many techniques can also identify post-transcriptional modifications present in any particular protein. Mass spectrometry is one of the most important enabling technologies for proteomics advances. In order to fully understand applications and uses of proteomics data we will need to delve deeply into both the experimental methodologies, and also the instrumentation, that make mass spectrometry so useful in this field. Our comp's visitor will be Benjamin Cravatt, from the Scripps Research Institute. Professor Cravatt's group has been at the forefront of developing techniques for what they call "functional proteomics," selectively probing particular classes of proteins. We will investigate Professor Cravatt's work from biological and analytical perspectives in the context of a broad exploration of proteomics experiments. Professor Cravatt will be on campus April 15-16.

**Group 4: Gretchen Hofmeister***Subject: Organic Synthesis**Scientist: Dean Toste, UC Berkeley*

You probably remember learning in introductory organic chemistry that alkynes react with mercury(II) sulfate (but not  $H^+$ ) in hydration reactions. Considering the toxicity and waste disposal hazards associated with mercury, it makes sense to mine other, related metals in the periodic table for comparable reactivity. A standout candidate is mercury's neighbor, gold, which has none of the toxicity of mercury and very similar valence orbitals and bonding properties. However, it wasn't until 1998 that Teles and coworkers developed the Au(I) catalyzed hydration of an alkyne. In the past five years, Toste and coworkers have extensively developed this chemistry and employed it in a host of useful carbon-heteroatom and carbon-carbon bond-forming reactions. Asymmetric variants that employ chiral ligands or chiral counterions are also successful. The broad scope of this methodology, its ease of implementation, and its benign impact on the environment contribute to its significance in organic synthesis. Join this group to learn more! In the mean time, visit the Toste research group's homepage: <http://www.cchem.berkeley.edu/~toste/toste.html>. Once there, click to his Publications page and link to publication 33, a Nature article by Gorin and Toste entitled "Relativistic Effects in Homogeneous Gold Catalysis," to pique your interest. Toste will be on campus May 6 and 7 to meet with the comp's group and present a seminar.

## Departmental Policy on Distinction

As a preamble to 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 a long paper involving library work or research. Since a long paper is an individual effort, a Comps advisor who sees a quality paper and oral presentation can easily determine the source of the effort 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 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 of 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.

## Comps Proposal Cover Page

Name: \_\_\_\_\_

Select a Comps Option:

- Long Paper
- Comps Group

If you have selected the Long Paper option, list below your topic and the advisor who has agreed to work with you on your comps. Attach to this form a one-page description of your proposed topic and two articles from the primary literature that relate to your topic.

If you have selected the Comps Group option, rank your preferences of Comps group below (1-most desired, 2-second choice, 3-ok, 4-no thank you). Attach a short statement describing your motivation and desire to participate in group Comps. In your statement also explain the preferences you have indicated.

### Rank

- \_\_\_\_\_ Group 1: Steve Drew  
Subject: Interfacial Chemistry  
Chemist: Professor Geri Richmond
  
- \_\_\_\_\_ Group 2: Marion Cass  
Subject: Coordination Chemistry  
Chemist: Professor Ken Raymond
  
- \_\_\_\_\_ Group 3: Joe Chihade and Deborah Gross  
Subject: Proteomics  
Chemist: Professor Benjamin Cravatt
  
- \_\_\_\_\_ Group 4: Gretchen Hofmeister  
Subject: Organic Synthesis  
Chemist: Dean Toste

Return to Wendy Zimmerman in the Chemistry Department Office or Steven Drew (Mudd 174) by **Wednesday, October 21.**