

# *Chemistry Comps 2011-2012*

*October 5, 2011*

*Comps Director: Will Hollingsworth*

This is the final version of the 2011-2012 Chemistry Comps document. In it you will find details of the two comps options (long-paper and group), timetables for the application process and the comps process, and complete information for this year's three comps groups. Please refer to the preliminary document from last spring for more complete information, particularly on alternate schedules for completing comps and comments about how distinction is determined.

## **Application Timeline**

Dates	Milestones
Wednesday, October 19	Comps application/proposal due. Complete the Comps Proposal Form available on the departmental web site.
Friday, October 28	Comps group assignments and registration information emailed to seniors.
Monday, October 31	Senior registration for winter term.

## **Some Important Points**

- The group comps option is currently offered only winter/spring and therefore is only an option for students enrolled during both of these terms. **All sections of group comps will meet during period 5a winter term.**
- Completing chemistry comps requires more than a single term of work; since the bulk of the work usually takes place in the winter term, it is normal to register for most of the six credits in winter and less in the spring. The credit distribution may differ if you opt for an unusual schedule and you will need to coordinate that with your advisor.
- You must submit a formal comps proposal to the comps coordinator. The schedule is listed above.
- It is expected that you will attend all comps-related chemistry talks (given by groups as well as visiting scientists) as part of your work in comps whether you do a long-paper or group comps.
- 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 avenue (such as taking and passing a set of comprehensive exams).

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

Two versions of the Long Paper exist. The first involves a literature topic of your choosing, while the second is an option for those who have done research and want to write a paper that expands on that research. The long-paper option 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 in particular a lot of work is still necessary after the completion of the first draft. 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 may require extra independent effort on your part and possibly a longer overall timeframe to make them work.*

The option exists to present a public seminar on your topic.

**Literature Topic Long Paper.** Those 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. *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 advisor indicating that he/she has agreed to work with you. You can consult with any of us in the selection of your advisor.

**The Research Long Paper.** This option is available for those who have been involved in a research project. It is intended to provide an opportunity for you to *extend* the scope of your necessarily limited laboratory work to include a broader perspective, quite like that of the "Literature Topic Long Paper" option. The Research Long Paper is not just a very large lab report. It is still 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 requirements and structure of the experience of the "Research Paper" as well as the proposal you are required to submit are the same as for the "Literature Topic Paper".

### Formal Requirements for Long Papers

1. *The weekly meeting.* You and your advisor will arrange a regular meeting time each week during the winter to discuss your topic and monitor your progress.
2. *The second reader.* One other faculty member will also carefully 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 ensure that both are familiar with your overall plan and topic. The second reader should be provided with drafts of your paper-in-progress on a schedule deemed appropriate.
3. *The oral defense.* Your project will culminate 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 give a public talk, you will need to decide whether or not to include this talk as part of the comps evaluation.
4. *The archiving.* After your defense, you will make any final revisions to your paper and then send this final draft for the library's archive at <https://contentdm.carleton.edu/comps/>. Instructions are given on the web site.

## Timeline for Completing the Long Paper

Two timelines for completing the long-paper option are available but only the standard winter-spring timeline is outlined below. Please refer to the preliminary document for the alternate schedule if you are planning ahead for next year. This winter-spring schedule has the bulk of the work occurring in the winter term and the remainder in the spring term. Non-negotiable deadlines are outlined with boxes; otherwise, you may have some flexibility in completing 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:**

- Select topic and advisor—allow enough time to prepare a good topic and find an advisor.
- Submit your comps proposal by October 19.
- Schedule times for winter term meetings with advisor (before the end of fall term).
- Gather interesting papers from the library's paper and electronic journal collections as well as 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 complete draft with figures, bibliography, etc. to your advisor.
- Week 10: Discuss the draft with advisor and identify areas for more work.

#### **Spring Term:**

- Week 1: Schedule date for oral defense with advisor and second reader.
- Revise, revise, revise!
- Weeks 4-5: The defensible 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 7-9: Submit two clean and bound copies of your final draft to Wendy Zimmerman.

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

In this comps option, groups averaging from about 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, and the project culminates with that person visiting campus and having lengthy discussions with group members. The specific topics for the three groups for this year are given on the last page of this document.

While this option is the most popular comps option, it is not for everyone. The group option can be a very educational way to do comps, but it does require lots of effort by all members for the group to be successful, while the long-paper is a suitable option for a more individualized comps experience. 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 lots of inflexible time commitments or if you prefer working and learning on your own. Under these circumstances, it would be better to opt for a Long Paper. You must also 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.*

Comps groups meet three times a week during period 5a in the winter term, and additional meetings are required during the early weeks of the spring term in preparation for the group talk and your scientist’s visit. 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 are working well, 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 departmental seminar, and supplemental library work).

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. The department reserves the right not to select a student for group comps at all if we are not convinced that the student will contribute to the process in an active and positive manner. Participation in a particular group is not assured but we will try hard to accommodate your preferences. Be aware that selection to group comps is made by the department and is decided before particular group assignments are made.

Your proposal to join a group—to be completed using the standard form on the website—should be a carefully prepared statement concerning your motivation for doing group comps instead of a long paper. This is a statement of your intent, desire, and ability to participate in a student-centered, group-learning endeavor. Offer any evidence you can indicating that you possess the ability and determination to be a *fully active participant* throughout the process. This need not be a lengthy statement and should be kept to no more than two pages of text. You should also indicate the context and strength for the group preferences you’ve indicated but no detailed discussion of the specific science of any of the group topics is necessary unless it relates to your specific choices.

If you are selected to a group, you will be required to attend a meeting near the end of fall term with your advisor and group members at which time expectations for the group are made clear and initial activities for over the break will be determined.

## 2011-12 Topics for Group Comps

### Group 1 (led by Marion Cass and Matt Whited)

*Subject: Mechanistic Organometallic Chemistry*

*Scientist: Paul Chirik (Princeton University)*

*Dates of Visit: April 12-13*

The Chirik group addresses synthetic problems of relevance to energy and sustainability, such as the homogeneous functionalization of atmospheric nitrogen and the use of earth-abundant (e.g., iron and cobalt) metals to carry out catalytic processes typically associated with precious metals (e.g., iridium and palladium). The following is taken from the Chirik website (<http://www.princeton.edu/chemistry/faculty/profiles/chirik/>) and describes their approach and methods:

*“Research ... is at the intersection of the traditional disciplines of organic and inorganic chemistry. The discovery of sustainable methods in chemical synthesis is a unifying theme in our projects. One area of long-standing interest is the discovery of new reactions for the functionalization of atmospheric nitrogen. A second interest is base metal catalysis and the elucidation of the electronic structure of redox-active metal-ligand complexes with emphasis on the integration of spectroscopy and theory. With these goals in mind, we study transition metal complexes from across the periodic table and use state-of-the-art multinuclear NMR experiments, X-ray diffraction techniques, isotopic labeling, Mössbauer and EPR spectroscopy as well as modern DFT methods to establish the electronic and molecular structures of the compounds and pre-catalysts we prepare.”*

### Group 2 (led by Joe Chihade and Dani Kohen)

*Subject: Single Molecule Biophysics*

*Scientist: Antoine Van Oijen (Groningen U., Netherlands)*

*Dates of Visit: April 19-20*

Using clever labeling chemistry and sophisticated imaging techniques, scientists can follow biochemical processes one molecule at a time. By removing ensemble averaging, observations at the single-molecule level offer an improved understanding of underlying molecular mechanisms. Distributions and fluctuations of molecular properties can be characterized, transient intermediates identified, and catalytic mechanisms elucidated. The van Oijen group utilizes and further develops novel single-molecule techniques to study DNA replication and viral fusion as well as other biological processes. For more details see his website at <http://www.singlemolecule.nl/research.html>.

### Group 3 (led by Trish Ferrett)

*Subject: Materials Chemistry using Nanotechnology*

*Scientist: Cathy Murphy, U. of Illinois at Urbana-Champaign*

*Dates of Visit: April 23-24*

Cathy Murphy's group works at the intersection of nanoscience, materials science, inorganic chemistry, and biophysical chemistry. Colloidal materials, including gold nanorods, are surface-engineered for a range of applications including imaging, biological sensing, and killing bacteria. Prof. Murphy recently won the 2011 Inorganic Nanoscience Award from the American Chemical Society. To learning more about this type of research, check out her website: <http://www.scs.illinois.edu/murphy/>.