Graduate School Demystified
Ken Hanson
FSU Department of Chemistry & Biochemistry
Graduate School Demystified: Outline

1) Application timeline
2) Deciding where to apply
3) The application/admission process
4) Graduate school timeline
5) Graduate school summary
6) After your Ph.D.
Applying for Graduate School in Chemistry

Dec 1-15: Application Deadline
- Transcript
- CV/Resume
- 3 letters of rec
- Cover letter
- GRE (some schools)

Late Dec-Feb: Admissions

Feb and Mar: Visitation Weekends

April 15th: Decision Deadline

Early August: Start Date
Where to Apply?

- Location
- Salary
- Department
- Resources
- Research
Where to Apply?

• Location
  - Weather
  - Proximity to home
  - Hobbies
  - Life experience

(Note that grad school is temporary!)
Where to Apply?

• Salary
  Base Pay: $19,000-$40,000
  Average: $26,500 (C&EN 2022)
  FSU: $27,000

Other factors:
  Tuition, fees, health insurance, guaranteed support
  Cost of living (https://www.nerdwallet.com/cost-of-living-calculator)
Where to Apply?

• Department Size

FSU Chemistry:
- 33 research active faculty
- ~160 graduate students
- ~40 postdoctoral fellows

https://www.acs.org/education/students/graduate/survey-of-phd-programs-in-chemistry.html
Where to Apply?

- Department Size
- Research Strengths

- Chemistry of Energy & Materials
  - Advanced Measurement & Analysis
  - Physical, Analytical, Biochemistry

- Chemistry of Health
  - Biochemistry, Organic, Physical

- Inorganic, Organic Physical, Materials
Where to Apply?

- Department
  - Size
  - Research Strengths
  - Collegiality
  - Social/Networking
  - Success rates
  - Graduate Student Union
Where to Apply?

- Department Size
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- Collaborative vs. Competitive
Where to Apply?

- Department Size
- Research Strengths
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- Success rates
- Graduate Student Union
- Collaborative vs. Competitive
- Ranking
Where to Apply?

• Resources
  - Equipment
  - Access
  - Support staff
  - Repairs
NMR Lab: Solid-State and Solution NMR 700, 600, 2 x 500, 400 and 2 x 300 MHz

MaC Lab: AFM, DSC, TGA, SQUID, BET

Mass Spec Lab: TOF, MALDI, GC, ICP, LC

X-Ray Lab: 3 x powder, 2 x Crystal, Fluorescence

Spectroscopy Lab: SS and TR spectroscopy, quantum yield, Raman/IR

Glass Blower, Machine, and Electrical Shop
Where to Apply?

• Research

Find at least two faculty that you would be excited to work with!
Where to Apply?

• Location
• Salary
• Department
• Resources
• Research
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Applying for Graduate School in Chemistry

Dec 1-15: Application Deadline

• Transcript
  Lower-level vs. upper-level GPA
  Check for minimum GPA

• CV/Resume
  Highlight research experience
  Publications

• 3 letters of rec
  Ideally people that know you well
  From research advisor

• Cover letter
  Faculty/research interests
  Address any shortcoming in your app

• GRE (some schools)
  Less and less common
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Applying for Graduate School in Chemistry

Late Dec-Feb: Admissions

- Graduate Admissions Committee (6 members)

Then you get an unofficial admissions email and/or phone call!
Applying for Graduate School in Chemistry

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Applying for Graduate School in Chemistry

Feb and Mar: Visitation Weekend

General Goals:

- Experience the town/university.
- Get a feel for the department culture.
- Get your questions answered.

Research goal is to find:

1) someone you want to work for.
2) a group you want to work with.
3) project/goal alignment.
4) something you would like to do on a daily basis.
Applying for Graduate School in Chemistry

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**Early August:** Start Date
“Students are under no obligation to respond to offers of financial support prior to April 15”

“[If a person accepts on offer but wants to change] the applicant must first inform the program that they are withdrawing or resigning from...Once they have informed the program that they are withdrawing, they then can accept any other offers.”
Applying for Graduate School in Chemistry

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Early August: Start Date
Ph.D at FSU: Timeline

1st weeks Orientation
1st Year 5 Classes
1st Sem. Lab Exploration and Choosing an Advisor
1st Year Teaching Assistant
2nd Year Research Presentation
3rd Year Ph.D. candidacy exam
4th Year Data Defense
4th-6th Year Thesis and Defense (average 5.2 years)
Ph.D at FSU: Timeline
1st weeks Orientation

- Intake paperwork
- Safety Training
- TA Training
- Teaching Tips
- Faculty Research Presentations
- and more…
# Ph.D at FSU: Timeline

## 1st Year  
**5 Classes (2 or 3 per semester)**

### Analytical Chemistry

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM 5140</td>
<td>Introduction to Chemical Instrumentation</td>
</tr>
<tr>
<td>CHM 5119</td>
<td>Mass Spectrometry</td>
</tr>
<tr>
<td>CHM 5151</td>
<td>Optical Methods of Chemical Analysis</td>
</tr>
<tr>
<td>CHM 5153</td>
<td>Electrochemistry</td>
</tr>
<tr>
<td>CHM 5154</td>
<td>Chemical Separations</td>
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### Special Topic Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
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<tbody>
<tr>
<td>CHM 5580</td>
<td>Special Topic in Analytical Chemistry</td>
</tr>
<tr>
<td>CHM 5454</td>
<td>Polymer Characterization (co-listed as CHM 6455)</td>
</tr>
<tr>
<td>CHM 5715</td>
<td>Characterization of Materials: NMR</td>
</tr>
<tr>
<td>CHM 5086</td>
<td>Environmental Chemistry</td>
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### Biochemistry

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<tbody>
<tr>
<td>BCH 5405</td>
<td>Molecular Biology</td>
</tr>
<tr>
<td>BCH 5505</td>
<td>Structure and Function of Enzymes</td>
</tr>
<tr>
<td>BCH 5745</td>
<td>Chemical and Physical Characterization of Biopolymers</td>
</tr>
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<tr>
<td>BCH 5884</td>
<td>Programming for Chemists and Biochemists</td>
</tr>
<tr>
<td>BCH 5886</td>
<td>Special Topic: Biomolecular Nuclear Magnetic Resonance</td>
</tr>
<tr>
<td>BCH 5887</td>
<td>Special Topic: Drug Target and Assay Development</td>
</tr>
</tbody>
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### Inorganic Chemistry

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<tbody>
<tr>
<td>CHM 5620</td>
<td>Principles of Inorganic Chemistry</td>
</tr>
<tr>
<td>CHM 5241</td>
<td>Group Theory of Inorganic Chemistry</td>
</tr>
<tr>
<td>CHM 5629</td>
<td>Solid State Inorganic Chemistry</td>
</tr>
</tbody>
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<tr>
<td>CHM 5881</td>
<td>Physical Methods in Inorganic Chemistry</td>
</tr>
<tr>
<td>CHM 5442</td>
<td>Advanced Inorganic Chemistry for Emerging Applications</td>
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### Material Chemistry

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<tr>
<td>CHM 5715</td>
<td>Chemistry of Materials; cross-listed as CHM4714</td>
</tr>
<tr>
<td>CHM 5450</td>
<td>Polymer Chemistry; cross-listed as CHM 6455</td>
</tr>
<tr>
<td>CHM 5454</td>
<td>Polymer Characterization</td>
</tr>
<tr>
<td>CHM 5629</td>
<td>Solid State Chemistry</td>
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<tr>
<td>CHM 5716</td>
<td>Characterization of Materials; NMR</td>
</tr>
<tr>
<td>CHM 5718</td>
<td>Topics in Materials Chemistry II: Magnetism and Magnetic Materials</td>
</tr>
<tr>
<td>CHM 5712</td>
<td>Nanomaterials</td>
</tr>
<tr>
<td>CHM 5880</td>
<td>Nuclear Magnetic Resonance Spectroscopy</td>
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### Organic Chemistry

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<th>Course Code</th>
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<tbody>
<tr>
<td>CHM 5226</td>
<td>Advanced Organic Chemistry: Reactions and Mechanisms</td>
</tr>
<tr>
<td>CHM 5245</td>
<td>Physical Organic Chemistry</td>
</tr>
<tr>
<td>CHM 5250</td>
<td>Advanced Organic Synthesis</td>
</tr>
<tr>
<td>CHM 5280</td>
<td>Advanced Organic Chemistry: Characterizations</td>
</tr>
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<tr>
<td>CHM 5380</td>
<td>Special Topic: Heterocycles</td>
</tr>
<tr>
<td>CHM 5380</td>
<td>Photochemistry and Photophysics</td>
</tr>
</tbody>
</table>

### Physical Chemistry

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<tr>
<td>CHM 5481</td>
<td>Advanced Quantum Mechanics</td>
</tr>
<tr>
<td>CHM 5506</td>
<td>Physical Chemistry of Macromolecules</td>
</tr>
<tr>
<td>CHM 5580</td>
<td>Nuclear Magnetic Resonance Spectroscopy</td>
</tr>
</tbody>
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After completing 5 classes, research focused!
Ph.D at FSU: Timeline

1st Sem. Lab Exploration and Choosing an Advisor

Phase 1) Meet with at least 3 faculty members. (by end of Sept.)

Phase 2) Do 2 or 3 lab explorations. (by end of Oct.)

Phase 3) Group selection. (by start of Nov.)
Ph.D at FSU: Timeline

1st Year Teaching Assistant

Laboratory TA
Monitor 2-3 labs per week. Office hours + lab grading.

Recitation TA
3 x 1 hour classroom periods. Office hours + exam grading.
Ph.D at FSU: Timeline

2nd Year Research Presentation

Area seminar (open to all)

20-minute presentation
5-10 minutes for questions

Introduction to your research.
Some preliminary results.
Ph.D at FSU: Timeline

3rd Year (Fall)  Ph.D. candidacy exam

Candidacy Exam (only committee members):
1) Written Component (i.e., Research Proposal)
   • <12 pages
   • style of an NSF or NIH R01 proposal
   • aims, rationale, literature review, preliminary data, and future work for the Ph.D.

2) Oral Component (~90 min. presentation; then questions)
   (a) Defense of research proposal (30-40 min.)
   (b) Defense of fundamental knowledge in chemistry

After you pass, you are officially a Ph.D. candidate!
(and receive your M.S. if you want it)
Ph.D at FSU: Timeline

4th Year Data Defense

“The Data Defense will demonstrate to the Ph.D. committee that the Ph.D. candidate has collected sufficient data of adequate quality to assemble the dissertation.”

Area seminar (open to all)

40-50 minute presentation
10-20 minutes for questions
Ph.D at FSU: Timeline

4th-6th Year Thesis and Defense (average 5.2 years)

Thesis/Dissertation:
A compilation of your graduate research
Highlights a unique contribution to science
Typically, 100-300 pages

Defense:
Open, 50 min presentation
10 min. for ? from audience
30-60 min. ? from the committee
Ph.D at FSU: Timeline

1st weeks  Orientation
1st Year    5 Classes
1st Sem.    Lab Exploration and Choosing an Advisor
1st Year    Teaching Assistant
2nd Year    Research Presentation
3rd Year    Ph.D. candidacy exam
4th Year    Data Defense
4th-6th Year Thesis and Defense (average 5.2 years)
<table>
<thead>
<tr>
<th>Imagine a circle that contains all of human knowledge:</th>
<th>By the time you finish elementary school, you know a little:</th>
<th>By the time you finish high school, you know a bit more:</th>
<th>With a bachelor's degree, you gain a specialty:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A master's degree deepens that specialty:</td>
<td>Reading research papers takes you to the edge of human knowledge:</td>
<td>Once you're at the boundary, you focus:</td>
<td>You push at the boundary for a few years:</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Until one day, the boundary gives way:</td>
<td>And, that dent you've made is called a Ph.D.:</td>
<td>Of course, the world looks different to you now:</td>
<td>So, don't forget the bigger picture:</td>
</tr>
<tr>
<td></td>
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<tr>
<td>Keep pushing.</td>
<td></td>
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</tbody>
</table>
Ph.D at FSU: Afterwards

Industry

AstraZeneca, Hercules, Vertex Pharmaceuticals, Amgen, Applied Biosystems, ThermoFinnigan, Nanostream, Ashland Chemical, PE Biosystems, Hoffman La Roche, General Dynamics, Bruker, DuPont CR&D, Merck, Pfizer, Johnson & Johnson, Waters, Rhône-Poulenc, Abbott Labs, Eli Lily, Varian NMR Inc....

Government

Scripps Fla., Batelle Pacific Northwest Nat’l Labs, NHMFL, Wright-Patterson AFB...

Academia:

MIT, U. of Michigan, U. of Minnesota, UC Irvine, U. of Maine, École Polytechnique, Albert Einstein College of Medicine, Cornell University, Georgia State, Univ. at Alabama at Huntsville, Univ. of Maryland...

Postdoctoral positions:

MIT, Cambridge, Caltech, Northwestern, NIH, ...
Graduate School Demystified: Outline

1) Application timeline
2) Deciding where to apply
3) The application/admission process
4) Graduate school timeline
5) Pushing the boundaries of knowledge
6) After your Ph.D.

Questions?