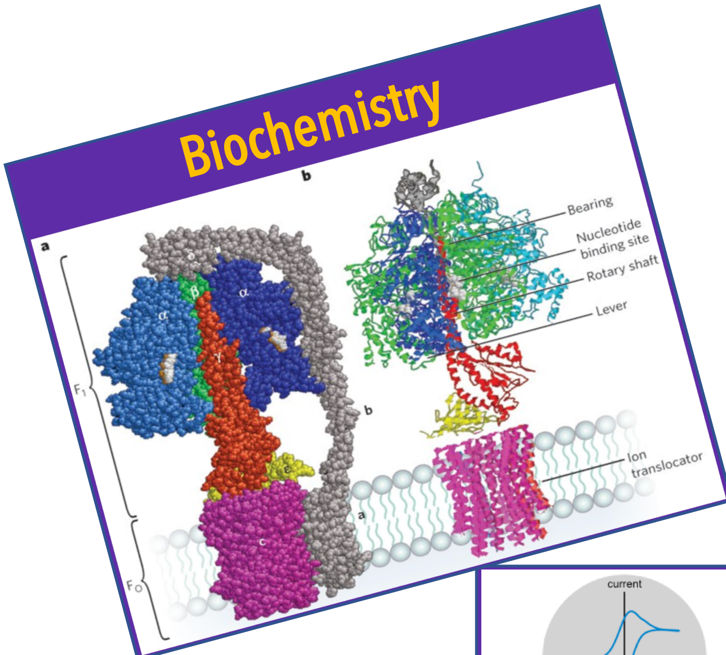
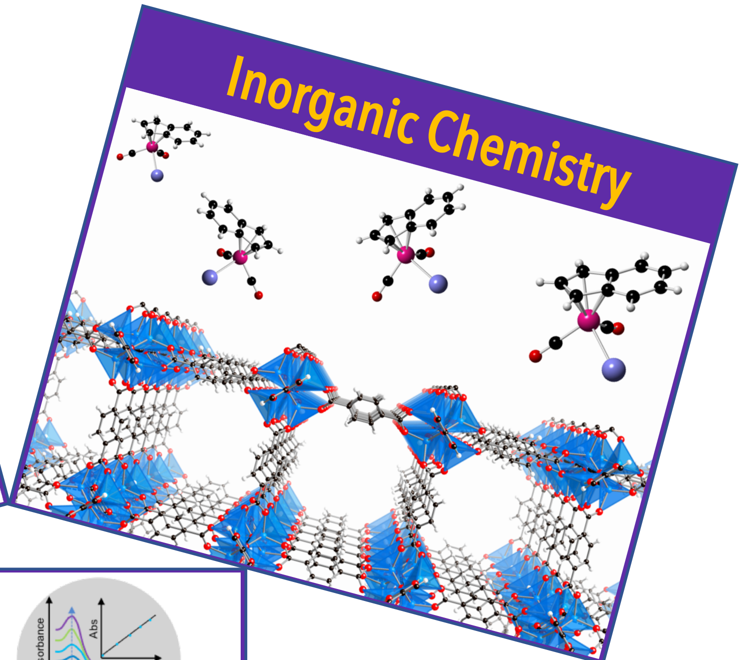
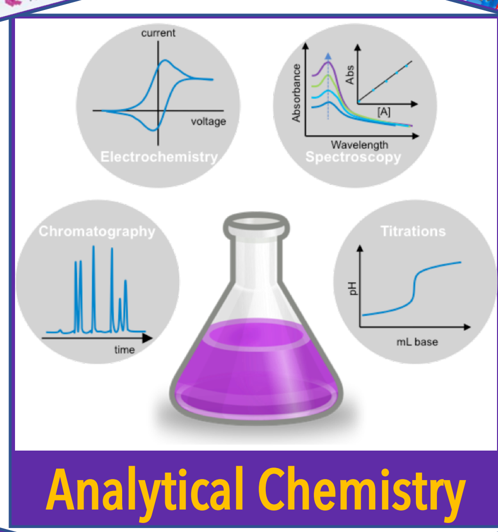
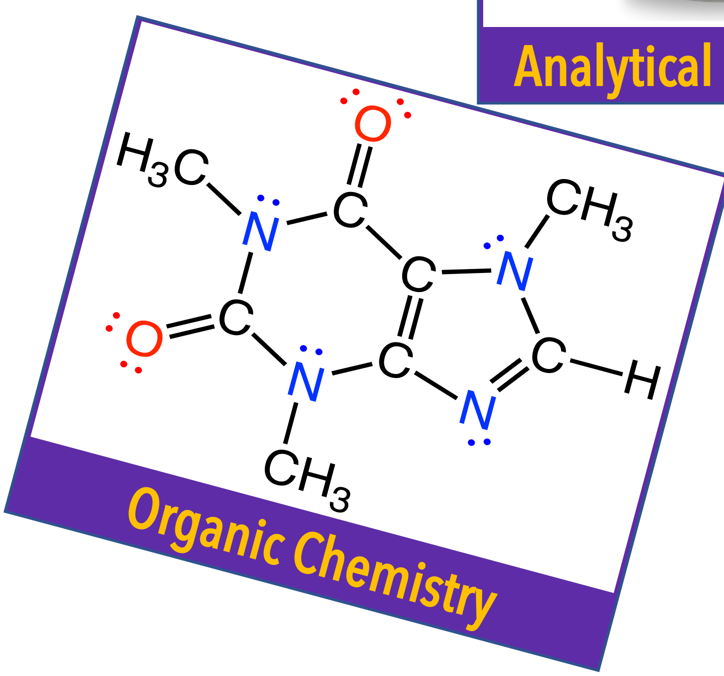
UW-Stevens Point
CHEMISTRY DEPARTMENT

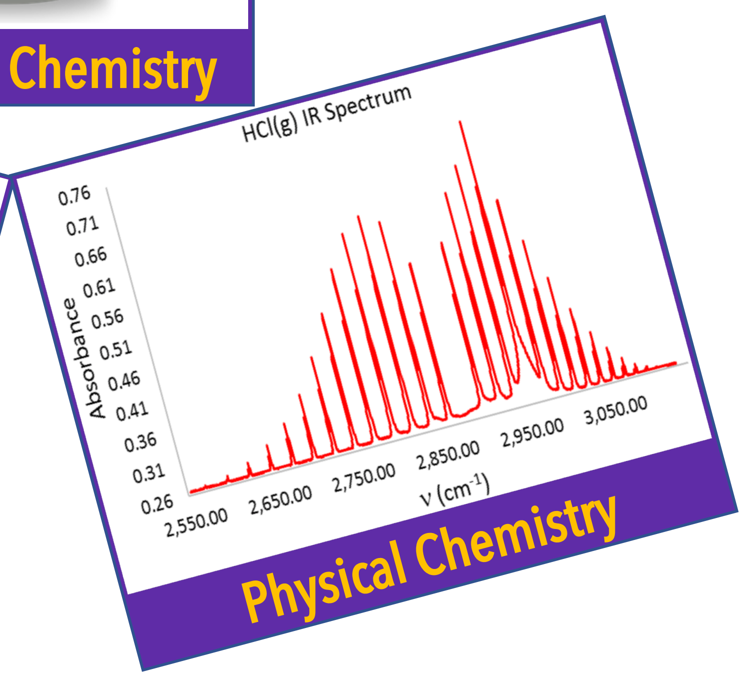
STUDENT HANDBOOK











DEPARTMENT OF CHEMISTRY

STUDENT HANDBOOK

Prepared by
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Revised: February 2018

TABLE OF CONTENTS

A LETTER FROM THE CHAIR

Welcome to the Department of Chemistry at UWSP!

As a student in our department, you are beginning your study of a discipline that is fascinating, challenging, and immensely rewarding. We hope to pass our curiosity and enthusiasm for chemistry on to you as we guide you through your studies. The chemistry department at UWSP does not have a graduate program in chemistry, in part because the faculty feel strongly that interaction with undergraduates in a one-to-one basis is the best foundation for learning. In contrast to many universities, a fully qualified faculty or staff member—not a graduate assistant—teaches every chemistry course on this campus, including laboratories. If you ever have questions or need help with assignments, your instructors' doors will be open to you. We are committed to working with you to help you achieve both your personal and professional goals.

This Handbook is your introduction to our department, its faculty and staff, and the curriculum, facilities, research opportunities, awards and scholarships available through the department. Use it throughout your career as a primary source of information about your major or minor in chemistry, remembering that your faculty advisor or instructors can help you to make the best decisions for your own individual circumstances.

We wish you success in your studies, and look forward to working with you!

Jason D'Acchioli, Chair
Department of Chemistry

THE DEPARTMENT OF CHEMISTRY

The Department of Chemistry at UWSP is part of the University's College of Letters and Science. It is comprised of more than twenty faculty and staff and has course enrollments of more than one thousand students per semester in over fifty sections of chemistry courses. Approximately fifteen chemistry majors and seventy minors graduate each year. Faculty and staff are able educators and researchers and are also active in a broad range of service projects at the local, regional, and national levels. The Department and its members are recognized as comprising a well rounded and high quality school of Chemistry.

Many students never realize how dynamic a university can be. At UWSP, the Department of Chemistry is constantly reviewing and improving its overall program. A number of internal committees are charged with initiating new endeavors and evaluating existing ones. These committees are either elected by the Department as a whole or are appointed by the Chair (who has the responsibility of overseeing the activities of the Department). Decisions on curricular affairs, majors and minors, equipment purchases and the like are made by the entire Department which meets in committee about every other week during the school year.

Many times the Department will solicit student input on different issues. Also, students hold positions on some of the departmental committees.

WHO NEEDS CHEMISTRY?

Chemistry is a very inclusive science. If your interests lie in experimental food science, geophysics, environmental studies, industrial formulations, theoretical descriptions of molecules or scores of other fields you will encounter chemistry sometime in your career. Environmental concerns and trade balance issues are making it crucial for government officials to have some understanding of chemical concepts. Consumers are finding it important to have at least some background in the science of chemistry just to read and evaluate the popular press, or even a food label. In short, chemical principles are so pervasive in today's society that Chemistry has become, in the words of one author, "The Central Science." To be well informed is to know at least some chemistry.

If this is true, then the practitioners of many different trades can consider chemistry a wise choice for a major or minor. In addition to the traditional areas of chemical research and development (a continuously growing field), medicine and health-related fields, paper science, biology, etc. there are definite needs for people with formal credentials in chemistry in many other areas. A major or minor in chemistry might be appropriate for the business major who wants to have a career in one of the largest international enterprises in today's world, the chemical industry; for the dietitian who wants to be able to analyze and evaluate foodstuffs and their interactions with living systems; for the artist interested in developing new media in graphic displays; for the communications major who wants to fill the sizable gap in conveying scientific concerns to the public; for the educator who wants to insure continued science-literacy by teaching sound chemistry principles to tomorrow's scientist. Every profession has a place for a trained chemist in its ranks.

AMERICAN CHEMICAL SOCIETY STUDENT AFFILIATE - THE CHEMISTRY CLUB

The UWSP Chemistry Department supports the local chapter of the American Chemical Society-Student Affiliate (ACS-SA). This is a student-run organization that helps promote interest in chemistry and chemical education specifically, and science in general. The ACS-SA encourages interaction between its members and the Chemistry Department faculty to help students become more comfortable with their education.

The Stevens Point ACS-SA has been nationally recognized for its excellence in promoting chemistry in the university and the community. For the 1997-98 academic year, they received recognition as a "Commendable" chapter by the ACS. Each year the organization plans many activities where students and faculty mingle. Some examples are the fall, spring, and holiday parties, bowling parties, a golf social, ski trips, and research nights. Becoming a member is a great way to become involved in the chemistry department and the university community.

AMERICAN SOCIETY FOR BIOCHEMISTRY AND MOLECULAR BIOLOGY -STUDENT CHAPTER

The UWSP Chemistry Department is home to a Student Chapter of the American Society for Biochemistry and Molecular Biology (ASBMB). This student-run, faculty-mentored club provides UWSP students with access and membership to the ASBMB, a professional society with over 12,000 members worldwide. Benefits of membership include; free access to ASBMB journals, a subscription to ASBMB Today, travel awards to attend the Annual Meeting of the ASBMB, membership in ASBMB Honor Society (ΧΩΛ), participation in the Undergraduate Research Poster Competition at the Annual Meeting, summer research scholarships, as well as numerous awards and scholarships only available to Student Chapter members.

Members of the UWSP Student Chapter are involved in research and education, culminating in presenting their work either locally at UWSP and/or nationally at the ASBMB Annual Meeting. Members also are involved in outreach programs such as local blood drives and organ donor signup drives. Student Chapter activities also include regular meetings where both student members and faculty share their research and outside speakers discuss career opportunities for members. One or two times per year Chapter members have gone on field trips to local and regional biochemical industries and graduate schools including Promega in Madison, Provident Nutraceuticals in Stevens Point and the Mayo Clinic Graduate School in Rochester, MN. Members also help host STEM Days for Kids at UWSP, help host fall and spring student/faculty picnics and organize a variety of social events for members.

EMPLOYMENT IN THE DEPARTMENT OF CHEMISTRY

The Department of Chemistry regularly employs students during the academic year to assist in many different areas of departmental activities. Student workers gain experience in laboratory preparations, assisting in the stockroom, grading papers, and other miscellaneous tasks. Depending on the availability of funds, some faculty members are able to pay students to work in their research laboratory during the normal school year and in the summer. Check with the Chemistry Department for current opportunities.

PLACEMENT

A crucial question in choosing a major is "Can I find a job when I graduate?" The UWSP Department of Chemistry plays a central role in helping its graduates find satisfying and appropriate employment upon completion of the chemistry or biochemistry major. This is done by personal referral and exposure of students to current openings. The department also provides individual assistance, as requested, in preparing resumes and applications and on how to handle a job interview. Personal letters of recommendation are also available from faculty familiar with the student's performance record. These letters might be written by the student's instructor in a particular course, academic advisor, and research advisor.

UWSP graduates in chemistry and biochemistry are very competitive in today's job market. About 35% of UWSP chemistry and biochemistry graduates go on to graduate or professional schools. Schools across the country have a high regard for the chemistry program at UWSP and vie competitively for our graduates. Successful job placement is usually attained within six months of graduation.

COLLOQUIUM SERIES

The Department of Chemistry Colloquium Committee maintains a very active series of presentations. Speakers from other institutions and related industries visit our Department to present and discuss some aspect of chemistry. These seminars are very important to the education of students and faculty alike because they provide exposure to a variety of chemistry related topics and a time for lively discussion. The seminars are open to all and are usually followed by an informal time of refreshments and conversation.

MORE INFORMATION

There is no reason to remain "in the dark" concerning any policies or practices within the Department of Chemistry. The faculty and staff are anxious to answer your questions and help you handle any problems that may arise. Your academic advisor is always a good place to start when you need assistance but if he or she is unavailable stop by any open office and you will receive a warm welcome. The Department office (D-l29) and stockroom (C-133) are particularly good sources of information. But remember, the only bad question is the one that goes unasked.

ROSTER OF CHEMISTRY FACULTY AND STAFF

	Title	Office	Office Phone	Email
Cristina Altobelli	Academic Department Associate	D129 Science	715-346-2888	caltobel@uwsp.edu
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Nate Bowling	Professor	D146 Science	715-346-3706	nbowling@uwsp.edu
Laura Cole	Associate Professor	B137 Science	715-346-4302	lcole@uwsp.edu
Timothy Corcoran	Lecturer	B133 Science	715-346-3894	tcorcora@uwsp.edu
Kevin Czerwinski	Professor	B150 Science	715-346-4154	kczerwin@uwsp.edu
Jason D’Acchioli	Professor and Chair	D129 Science	715-346-2297	jdacchio@uwsp.edu
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Amanda Jonsson	Assistant Professor	B145 Science	715-346-2600	ajonsson@uwsp.edu
Jim Lawrence	Associate Professor	D142 Science	715-346-3699	jlawrenc@uwsp.edu
Arin Lemke	Lab Instructor	B147 Science	715-346-4467	alemke@uwsp.edu
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Katie McGarry	Assistant Professor	D131 Science	715-346-3328	kmcgarry@uwsp.edu
Joe Mondloch	Assistant Professor	D145 Science	715-346-3715	jmondloc@uwsp.edu
Shannon Riha	Assistant Professor	D140 Science	715-346-2172	sriha@uwsp.edu
Gary Shulfer	Instructional Specialist	B131 Science	715-346-4138	gshulfer@uwsp.edu
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Brent Speetzen	Stockroom Manager	C133 Science	715-346-3759	bspeetze@uwsp.edu
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Dave Szpunar	Assistant Professor	B129 Science	715-346-3771	dszpunar@uwsp.edu
Robin Tanke	Professor	D141 Science	715-346-4325	rtanke@uwsp.edu
Anthony Timerman	Professor	D144 Science	715-346-3167	atimerma@uwsp.edu
Jim Tuszka	Senior Electronics Technician	D021 Science	715-346-4201	jtuszka@uwsp.edu

TRANSFER STUDENTS

If you are transferring into the University from another institution and intend to major in chemistry you should meet with the chairperson of the department prior to registration for courses your first semester. The chairperson will review your previous course background, decide which of your previously taken courses can be transferred to our University for credit, and assist you in drawing up a schedule of courses that will move you through the major in a reasonable time frame. You are encouraged to complete the 100 and 200 level chemistry, math, and physics courses as soon as possible since these serve as prerequisites for our upper division curriculum. The chairperson will also assign you an academic advisor from the chemistry faculty. You will meet with your advisor at least once per semester to discuss progress towards your degree, course options, and career options.

As a transfer student the grades you earned at another campus are not included in calculating your GPA nor in applying other regulations. However, all grades will be counted if you apply for teacher certification.

All chemistry majors are encouraged to get involved with our American Chemical Society Student Affiliate group. Via this organization you will have an opportunity to meet chemistry majors and faculty, participate in social activities, and learn about careers in chemistry.

THE CHEMISTRY MINOR

The Chemistry Minor of UWSP is designed to give students a solid background in chemistry to supplement a major in other areas. It consists of 26 credits (21 credits if taking Chem 117).

You may take one of the following course sequences:

1. Chem 105 and 106 or Chem 117, 248, 325, 326, and a minimum of 4 credits selected from Chem 329, 335, 365, 371, 387 or the combination of Water/Geology 487 and Water 492.
2. Chem 105 and 106 or Chem 117, 220, 248, 260, and the combination of Water/Geology 487 and Water 492. (*Intended for Fisheries and Water Resources majors and subject to offering of water courses*.)

It is highly recommended that students select the courses required to fulfill the minor in consultation with the faculty of the Chemistry Department in order to best complement the student's major and career goals.

THE CHEMISTRY MAJOR

If you wish to major in chemistry, you should normally apply for acceptance at the end of your sophomore year. To be accepted you must have completed or be enrolled in Chem 326, Math 121 and Physics 250. You can have no more than one grade below C- in any chemistry, mathematics, or physics courses numbered below 299 required in the chemistry major. After acceptance you must maintain an overall GPA of 2.00 (2.75 to student teach) in ALL chemistry courses and collateral courses. You can apply no more than one grade below C in chemistry courses numbered 300 or above to the major. These requirements apply regardless of a declaration of academic bankruptcy. Exceptions concerning academic bankruptcy may be granted by the Department. Please see the note concerning special circumstances on page 15.

There are two routes by which one may earn a chemistry major. Each route starts with a two semester general chemistry sequence and the following core of chemistry and collateral courses.

Chemistry Core:

Chem 105 and 106 or 117, 248, 325, 326, 335, 336, 355, 446.

Collateral Courses:

Math 120, 121, 222
Physics 240, 250

Additional courses which build upon this core and complete each of the two routes are shown below.

A. Chemistry Major

Consists of a minimum of 64 credits (59 credits if taking Chem 117):

1. The chemistry core and collateral courses.
2. Chem 365.
3. At least 2 credits chosen from 329L, 339L, 371, 387, 425, 455 (L indicates lab work).

B. Chemistry Major for Professional Certification by the American Chemical Society

Consists of a minimum of 71 credits (66 credits if taking Chem 117):

1. The chemistry core and collateral courses.
2. Chem 329, 339, 365, 455.
3. At least 3 credits chosen from the following courses: 371, 387, 425, 499. You may substitute one advanced course in another science for one chemistry course in this group with the approval of the chair.
4. A reading knowledge of a foreign language is strongly recommended.

CURRICULA IN THE CHEMISTRY MAJORS

Notes:

1. In addition to the courses in the chemistry curriculum there are many General Degree Requirements which a student must satisfy in order to receive a degree from UWSP. These requirements are detailed in the University Catalog and in each issue of the UWSP timetable (in the back under Bachelor of Science). The ultimate responsibility for meeting the General Degree Requirements lies with the student.

2. Several of the chemistry courses listed below are designed as service courses or for majors other than chemistry, and they do not count toward the chemistry major.

3. A grade of F in a 100-numbered chemistry course may be replaced by a subsequent grade in another 100-level Chemistry course with the consent of the chair of the department. (See “Repeating Courses” in the section of the University Catalog entitled “More Academic Information”.)

   In special cases a D in Chem 117 can be replaced by a subsequent grade in 106 with prior authorization from the department chair.

4. The normal junior course, Chem 335, physical chemistry, has prerequisites of Chem 248 and 325, Physics 240, and Math 222. It is important that you plan your freshman and sophomore years in order to satisfy these requirements and stay on track.

5. Students are encouraged to talk often with their academic advisors in the Department concerning their progress towards a degree. Your advisor is not only available to give counsel concerning your academic requirements but is also your primary contact with the Department and University if special circumstances arise.

SUGGESTED COURSE SEQUENCE FOR CHEMISTRY MAJOR 1

The following schedule assumes that the student starts with **Chem 105** and places into Math 120. A suggested course sequence starting with **Chem 117** is on the next page.

Year	Fall semester		Spring semester	
	Course	Credits	Course	Credits
I	**Chem 105** **Math 120** *GEP and/or Electives**	5 4 5-6 Total = 14-15	**Chem 106** **Math 121** *GEP and/or Electives*	5 4 5-6 Total = 14-15
II	**Chem 248**** **Chem 325** **Math 222** **Phys 240**	4 4 4 5 Total = 17	**Chem 326** **Chem 355** **Phys 250** *GEP and/or Electives*	4 3 5 2-3 Total = 14-15
III	**Chem 335** *GEP and/or Electives*	4 10-13 Total = 14-17	**Chem 336** *GEP and/or Electives*	3 12 Total = 15
IV	**Chem 365** *GEP and/or Electives*	4 11 Total = 15	**Chem 446** *GEP and/or Electives*	4 9-12 Total = 13-16

* In addition to the courses listed above, students must take at least 2 credits of chemistry electives. Elective courses are listed in the online course catalog and are at the 300 and 400 levels.

** If Chem 248 is taken during the summer, then 2-4 credits of *GEP and/or Electives* should be taken.

SUGGESTED COURSE SEQUENCE FOR CHEMISTRY MAJOR 2

The following schedule assumes that the student starts with **Chem 117** places into Math 120.

Year	Fall semester		Spring semester	
	Course	Credits	Course	Credits
I	**Chem 117** **Math 120** *GEP and/or Electives**	5 4 5-6 Total = 14-15	**Chem 248**** **Math 121** *GEP and/or Electives*	4 4 5-6 Total = 14-15
II	**Chem 325** **Math 222** **Phys 240** *GEP and/or Elective*	4 4 5 3-4 Total = 16-17	**Chem 326** **Chem 355** **Phys 250** *GEP and/or Electives*	4 3 5 2-3 Total = 14-15
III	**Chem 335** *GEP and/or Electives*	4 10-13 Total = 14-17	**Chem 336** *GEP and/or Electives*	3 12 Total = 15
IV	**Chem 365** *GEP and/or Electives*	4 11 Total = 15	**Chem 446** *GEP and/or Electives*	4 9-12 Total = 13-16

* In addition to the courses listed above, students must take at least 2 credits of chemistry electives. Elective courses are listed in the online course catalog and are at the 300 and 400 levels.

** If Chem 248 is taken during the summer, then 2-4 credits of *GEP and/or Electives* should be taken.

SUGGESTED COURSE SEQUENCE FOR ACS CERTIFIED CHEMISTRY MAJOR 1

The following schedule assumes that the student starts with **Chem 105** and places into Math 120. A suggested course sequence starting with **Chem 117** is on the next page.

Year	Fall semester Course	Fall semester Credits	Spring semester Course	Spring semester Credits
I	**Chem 105** **Math 120** *GEP and/or Electives*[*]	5 4 5-6 Total = 14-15	**Chem 106** **Math 121** *GEP and/or Electives*	5 4 5-6 Total = 14-15
II	**Chem 248**[**] **Chem 325** **Math 222** **Phys 240**	4 4 4 5 Total = 17	**Chem 326** **Chem 355** **Phys 250** *GEP and/or Electives*	4 3 5 2-3 Total = 14-15
III	**Chem 335** **Chem 329** *GEP and/or Electives*	4 2 10 Total = 16	**Chem 336** **Chem 339** *GEP and/or Electives*	3 1 11 Total = 15
IV	**Chem 365** *GEP and/or Electives*	4 11 Total = 15	**Chem 446** **Chem 455** *GEP and/or Electives*	4 3 8 Total = 15

* In addition to the courses listed above, students must take at least credits of chemistry electives. Elective courses are listed in the online course catalog and are at the 300 and 400 levels.

** If Chem 248 is taken during the summer, then 2-4 credits of *GEP and/or Electives* should be taken.

SUGGESTED COURSE SEQUENCE FOR ACS CERTIFIED CHEMISTRY MAJOR 2

The following schedule assumes that the student starts with **Chem 117** and places into Math 120.

Year	Fall semester		Spring semester	
	Course	Credits	Course	Credits
I	**Chem 117** **Math 120** *GEP and/or Electives**	5 4 5-6 Total = 14-15	**Chem 248**** **Math 121** *GEP and/or Electives*	4 4 6-7 Total = 14-15
II	**Chem 325** **Math 222** **Phys 240** *GEP and/or Electives*	4 4 5 2-4 Total = 15-17	**Chem 326** **Chem 355** **Phys 250** *GEP and/or Electives*	4 3 5 2-3 Total = 14-15
III	**Chem 335** **Chem 329** *GEP and/or Electives*	4 2 10 Total = 16	**Chem 336** **Chem 339** *GEP and/or Electives*	3 1 11 Total = 15
IV	**Chem 365** *GEP and/or Electives*	4 11 Total = 15	**Chem 446** **Chem 455** *GEP and/or Electives*	4 3 8 Total = 15

* In addition to the courses listed above, students must take at least credits of chemistry electives. Elective courses are listed in the online course catalog and are at the 300 and 400 levels.

** If Chem 248 is taken during the summer, then 2-4 credits of *GEP and/or Electives* should be taken.

THE BIOCHEMISTRY MAJOR

This major is administered jointly by the Biology and Chemistry Departments

Karin Bodensteiner, Chair of Biology Department
Room 167A, College of Natural Resources Building
Phone: 715-346-2159
E-mail: biology@uwsp.edu
Web: www.uwsp.edu/biology

Jason D'Acchioli, Chair of Chemistry Department
Room D129A, Science Building
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E-mail: chemistry@uwsp.edu
Web: www.uwsp.edu/chemistry

Biochemistry is a major that combines the knowledge of biology and chemistry to explain life processes in terms of molecular structure and chemical reactions within living cells. This interdisciplinary major has a chemistry-based curriculum, coupled with a significant biology component. The role of a biochemist is to look for understanding of organismal diversity in the principles and concepts of chemistry and physics, as well as in the structure, mechanisms and chemical processes that are common to all organisms. The Biochemistry major provides the student with a course of study that links biological sciences, like molecular biology and genetics, to physical sciences, like chemistry and physics. In addition, the Biochemistry major combines the interdisciplinary foundation inherent to biochemistry with all the advantages of a liberal arts education.

If you wish to major in Biochemistry, you must apply for acceptance into the major through the Department of Chemistry or Biology no later than the first semester of your junior year. To be admitted, retained, and approved for graduation as a Biochemistry major, you must have a minimum cumulative grade point average of 2.50 for all courses taken within the major (2.75 to student teach in Biochemistry or Biology), including collateral courses and regardless of a declaration of academic bankruptcy. If you are a transfer student, you meet this requirement by having at least a 2.50 GPA in the total major (UWSP and transfer credits). No more than 6 credits of D work in Biology, Chemistry, and Biochemistry courses will be counted toward the completion of the Biochemistry major. All grades of D or F are used to compute the cumulative GPA in the major. If a course is repeated, the last grade earned is the grade used in GPA calculation. Courses with grades of D or F may be repeated only with the consent of the Chair of the Biology or Chemistry Departments and only if a seat is available after the regular registration period.

NOTES:

1. Please read the **NOTES** under the Biology and Chemistry sections of the catalog. All items under these sections also apply to the Biochemistry major.
2. The Biochemistry major is the same regardless of the college from which you graduate. If you have a single major (Biochemistry), you will graduate from the College of Letters and Science. If you are in education, you may graduate from either the College of Letters and Science or from the College of Professional Studies. If you have a double major, such as Biochemistry and Natural Resources, you may graduate from the College of Letters and Science or the College of Natural Resources.

3. Courses in Biology, and Chemistry are open to all students who meet the prerequisites.
4. Communication in the Major is satisfied by earning credit in Biology 490 and in the 200 and 300-level chemistry courses that are listed as core requirements. The physics and math courses are not part of the Communication in the Major.
5. Capstone Experience is satisfied by earning credit in Biology 490. Biology 490 with the designation "seminar in molecular biology" is preferred.

CURRICULA IN THE BIOCHEMISTRY MAJOR

The major consists of a minimum of 82 total credits (77 credits if taking Chem 117), 22 of which count towards general degree requirements.

A. <u>All students must take the following Biochemistry core courses and collateral courses, 74 credits (69 credits if taking Chem 117)</u>:
   1. Biology 130, 160, 210, 351 or 381 or 385, 314, 318, 319, 490 (seminar, molecular biology preferred).
   2. Chemistry 105 and 106 or 117, 248, 325, 326, 333, 365.
   3. Math 120, 355
   4. Physics 203, 204 (or 240, 250)

B. <u>All students must take 8 credits of elective courses to be chosen from the following list</u>:

   Note: These courses can be selected in order to earn one of the emphases listed under Section C.

   Biology 310, 312, 333, 351*, 381*, 382, 385*, 389, 390, 399 (2 cr max), 400, 415, 420
   * If not included in the core requirements in section A.
   Chemistry 329, 355, 387 425, 499 (2 cr max)
   Math 121, 222

C. <u>Areas of Emphasis</u>

   Note: The emphases below are not majors or specialties that will be listed on your official transcript. These are simply ways of personalizing your program of study to best fit your career goals. Students who have a particular career interest should choose electives appropriate to their career goals after consultation with their advisor. The following is a list of suggested courses from the Biology / Chemistry / Math electives category for particular emphases.

   - ***Biochemistry / Chemistry / Biophysics*:** Chemistry 335, 336, Math 121, 222
   - ***Biotechnology / Molecular Biology / Genetics:*** Biology 310, 312, 333, 389, 415, 420

Courses

Course descriptions are listed under the Biology and Chemistry sections of the catalog.

SUGGESTED COURSE SEQUENCE FOR BIOCHEMISTRY MAJOR 1

The following schedule assumes that the student starts with **Chem 105** and needs to take Math 118 and 119 as preparation for **Math 120**. A suggested course sequence starting with **Chem 117** is on the next page.

Year	Fall semester		Spring semester	
	Course	Credits	Course	Credits
I	**Biol 001** **Biol 130 or 160** **Chem 105** *GEP and/or Electives*[*]	0 5 5 6 Total = 16	**Biol 160 or 130** **Chem 106** *GEP and/or Electives*	5 5 6 Total = 16
II	**Biol 210** **Chem 325** Math 118 *GEP and/or Electives*	3 4 4 4 Total = 15	Math 119 **Chem 248** **Chem 326** **Biol 351 or 381 or 385**[**]	2 4 4 4 Total = 15
III	**Biol 314** **Math 120**[***] **Phys 203 or 240**[****] *GEP and/or Electives*	4 4 5 3 Total = 16	**Chem 365** **Phys 204 or 250**[***] *GEP and/or Electives*	4 5 6 Total = 15
IV	**Math 355**[***] **Biol 320** *GEP and/or Electives*	4 4 7 Total = 15	**Chem 333**[*****] **Biol 490**[*****] *GEP and/or Electives*	3 2 10 Total = 15

* Electives include 8 credits of courses (Biol, Chem, Math) that are required as part of the biochemistry major. See the course catalog for a listing of current courses that satisfy this requirement.

** One of these three physiology courses is required.

*** The order of Math 120 and 355 can be reversed.

**** Take either Phys 203/204 or 240/250

***** Chem 333 can be taken fall semester

Some of the required courses are also offered during the summer.

SUGGESTED COURSE SEQUENCE FOR BIOCHEMISTRY MAJOR 2

The following schedule assumes that the student starts with **Chem 117** and needs to take Math 118 and 119 as preparation for **Math 120**.

Year	Fall semester		Spring semester	
	Course	Credits	Course	Credits
I	**Biol 001** **Biol 130 or 160** **Chem 117** *GEP and/or Electives***	0 5 5 6 Total = 16	**Biol 160 or 130** **Chem 248** *GEP and/or Electives*	5 4 6 Total = 15
II	**Biol 210** **Chem 325** Math 118 *GEP and/or Electives*	3 4 4 4 Total = 15	Math 119 **Chem 326** **Biol 351 or 381 or 385**** *GEP and/or Electives*	2 4 4 5-6 Total = 15-15
III	**Biol 314** **Math 120***** **Phys 203 or 240****** *GEP and/or Electives*	4 4 5 3 Total = 16	**Chem 365** **Phys 204 or 250***** *GEP and/or Electives*	4 5 6 Total = 15
IV	**Math 355***** **Biol 320** *GEP and/or Electives*	4 4 7 Total = 15	**Chem 333******* **Biol 490******* *GEP and/or Electives*	3 2 10 Total = 15

* Electives include 8 credits of courses (Biol, Chem, Math) that are required as part of the biochemistry major. See the course catalog for a listing of current courses that satisfy this requirement.
** One of these three physiology courses is required.
*** The order of Math 120 and 355 can be reversed.
**** Take either Phys 203/204 or 240/250
***** Chem 333 can be taken fall semester

Some of the required courses are also offered during the summer.

THE PRE-PHARMACY CURRICULUM

If you are interested in completing a Pharmacy Doctorate or a BS in Pharmacology & Toxicology, you may start your course sequence here, and then transfer to UW-Madison or other pharmacy schools. There are certain courses which must be completed in order to be admitted to UW-Madison's program.

The following courses should be completed in your freshman and sophomore years: Chemistry 105 and 106 or 117; 325, 326; Mathematics 120 and 355; Physics 203 and 204 (or 240 and 250); Biology 160 and (130 or 210) and 333.

Other courses required for admission to Madison's program: English 202 or 150; Economics 111; Sociology 101 or Anthropology 101 or 110; Psychology 110 or 320.

Other pharmacy programs might have different course requirements. For additional information, a pre-pharmacy advisor can be consulted.

CHEMISTRY COURSE DESCRIPTIONS

Some restrictions apply to who can receive credit for courses and which courses satisfy major and minor requirements. See the University Catalog for a current listing of these restrictions.

CHEMISTRY 100 - 3 credits - *CHEMISTRY FOR THE CITIZEN* Selected principles of chemistry, emphasizing the relation between chemistry and modern society. Two hrs lec, three hrs lab per week. This course can be applied toward the general requirements for a degree. Prereq: Math 95 or QL completed or suitable math placement score. (I, II)

CHEMISTRY 101 - 5 credits - *BASIC CHEMISTRY* For students who desire only one semester of college chemistry. Introduction to atomic and molecular structure, bonding, stoichiometry, descriptive chemistry of both inorganic and organic compounds; selected topics in environmental and consumer chemistry. Three hrs lec, one hr disc, three hrs lab per wk. Prereq: Math 95 or QL completed or suitable math placement score. (I, II)

CHEMISTRY 105 - 5 credits - *FUNDAMENTAL CHEMISTRY* For students who desire one year of college chemistry. Fundamental principles and theories of chemistry, including stoichiometry, atomic and molecular structure and bonding, nuclear chemistry, thermodynamics, descriptive chemistry of nonmetals and transition metals, chemical kinetics and equilibria, introduction to organic chemistry. Three hrs lec, one hr disc, three hrs lab per wk. Prereq: Highschool chemistry or CHEM 101 recommended; con reg in MATH 107 or suitable math placement test score. (I, II)

CHEMISTRY 106 - 5 credits - *FUNDAMENTAL CHEMISTRY* Continuation of 105. Three hrs lec, one hr disc, three hrs lab per wk. Prereq: CHEM 105 with grade of C- or better and completion of Math 107 or suitable math placement test score. (I, II)

CHEM 117 - 5 cr. - *GENERAL CHEMISTRY PRINCIPLES* (1 semester course for especially well-prepared students). Laws and principles of chemistry including atomic and molecular structure, review of stoichiometry, descriptive inorganic chemistry of the representative and transition elements, chemical equilibria, electrochemistry, thermodynamics, and chemical kinetics. 3 hrs lec, 1 hr disc, 3 hrs lab per wk. Prereq: AP / IB HS chemistry or four semesters high school chemistry with grades of B or better; Math 118 or suitable math placement test score; cons chair. (I)

CHEMISTRY 220 - 4 credits - *SURVEY OF ORGANIC CHEMISTRY* A systematic survey of the compounds of carbon for students who desire only one semester of organic chemistry. Does not count toward chemistry major. Three hrs lec, three hrs lab per wk. Prereq: CHEM 106 or 117. (I)

CHEMISTRY 221 - 3 credits - *SURVEY OF ORGANIC CHEMISTRY LECTURE* A systematic one semester lecture only survey of the compounds of carbon. Only for limnology/fisheries or watershed hydrology/mgt majors. Does not count toward chemistry major. Three hrs lec per wk. Prereq: CHEM 106 or 117, or cons instructor. (I)

CHEMISTRY 248 - 4 credits - *QUANTITATIVE ANALYSIS* Theory and methods of quantitative chemical analysis including effects of chemical equilibria on quantitative separations, titration curves, polyprotic acids and buffers, and oxidation-reduction processes. Two hrs lec, six hrs lab per wk. Prereq: CHEM 106 or 117 with grade of C- or better. (I, II)

CHEMISTRY 260 - 4 credits - *ELEMENTARY BIOCHEMISTRY* Introduction to the structure and cellular reactions of the primary constituents of living cells; for students with limited preparation in organic chemistry. Three hrs lec, three hrs lab per wk. Does not count toward chemistry major. Prereq: CHEM 220 or 326. (II)

CHEMISTRY 299 - 1 credit - *INTRODUCTION TO RESEARCH* Chemistry majors and minors may arrange for independent research with a faculty member. Projects introduce students to chemical research. May be repeated. Does not count toward any chemistry major or minor. Prereq: cons chair. (I, II)

CHEMISTRY 325 - 4 credits - *ORGANIC CHEMISTRY* (Two semester course) A study of the structure, conformation, stereochemistry, properties and reactions of organic compounds. Structure-property relationships and reaction mechanisms and their application in the study of a broad range of representative functional groups and compounds including carbohydrates, polymers, amino acids and proteins. Retrosynthetic analysis and spectroscopic characterization of organic molecules. Three hrs lec, three hrs lab per week. Prereq: CHEM 106 or 117 with grade of C- or better. (I,II)

CHEMISTRY 326 - 4 credits - *ORGANIC CHEMISTRY* Continuation of 325. Three hrs lec, three hrs lab per wk. Prereq: CHEM 325 with grade of C- or better. (I,II)

CHEMISTRY 329 - 2 credits - *ADVANCED SYNTHESIS LABORATORY* Advanced techniques in the synthesis and characterization of organic and inorganic compounds. Six hrs lab per wk. Prereq: CHEM 248, 326, and 355. (I)

CHEMISTRY 333 - 3 credits – *BIOPHYSICAL CHEMISTRY* (One semester course for Biochemistry Majors). An examination of the physiochemical principles underlying the structure and chemical properties of macromolecules of biological importance, including the principles of thermodynamics, equilibrium, kinetics, and dynamics. Methods for the separation and isolation of macromolecules and their spectroscopic characterization will be addressed. Three hrs lec per week. Prereq: MATH 120, PHYS 204 or 250, CHEM 365; accepted biochemistry major or cons chair. (II)

CHEMISTRY 335/535 - 4 credits - *PHYSICAL CHEMISTRY* Laws and principles of chemical thermodynamics and kinetics. Three hrs lec, three hrs lab per week. Prereq: CHEM 248 and 325; MATH 222; PHYS 240; or cons instr. (I)

CHEMISTRY 336/536 - 3 credits - *PHYSICAL CHEMISTRY* Laws and principles of physical chemistry covering atomic and molecular structure, quantum mechanics, chemical bonding, and spectroscopy. Three hrs lec per week. Prereq: CHEM 325; MATH 222; PHYS 250; or cons instr. (II)

CHEMISTRY 339/539 - 1 credit - *PHYSICAL CHEMISTRY LABORATORY II* Extension of 335 with an emphasis on the utilization of spectroscopic methods to probe the electronic structure of atoms and molecules and the nuclear motions within molecules. Introduction to the use of lasers in spectroscopy and kinetics. Three hours per wk. Prereq: CHEM 336 or con reg. (II)

CHEMISTRY 355 - 3 credits – *INTERMEDIATE INORGANIC CHEMISTRY* An introduction to the chemistry of inorganic compounds and materials. Descriptive chemistry of the elements. A survey of Crystal Field Theory, band theory, and various acid-base theories. Use of the chemical and scientific literature. Introduction to the seminar concept. Three hours lecture per week. Prereq: MATH 120 or con reg.; CHEM 325. (II)

CHEMISTRY 365/565 - 4 credits - *BIOCHEMISTRY* Introduction to the structure of principal biomolecules, the nature and mechanism of cellular reactions, and the central pathways of metabolism. Three hours lecture, three hours lab per week. Prereq: CHEM 248 and 326; acceptance into chemistry major/minor, biochemistry major or cons. chair. (I, II)

CHEMISTRY 371 - 1 credit - *INTRODUCTION TO THE CHEMISTRY OF MATERIALS* Descriptions of main classes of materials - metals, ceramics and glasses, natural and synthetic polymers, composites, and semiconductors; emphasis on relationships between chemical structure, physical and chemical properties, and end use. One hour lecture per week. Prereq: CHEM 326 or con reg. (I)

CHEMISTRY 387 - 1 credit - *SPECTRAL IDENTIFICATION OF ORGANIC COMPOUNDS* Advanced treatment of organic compound identification based on spectral analysis. Two hours per week. Prereq: 326 or cons instr. (II)

CHEMISTRY 399 - 1-3 credits – *SPECIAL WORK* Chemistry majors and minors may arrange for independent projects with a faculty member. May be repeated. Does not count toward any chemistry major or minor. (I,II)

CHEMISTRY 425/625 - 3 credits - *ADVANCED ORGANIC CHEMISTRY* Advanced principles and applications of organic chemistry including reaction mechanisms, advanced stereochemistry, and physical organic chemistry. Prereq: CHEM 326. (I)

CHEMISTRY 446/646 - 4 credits - *INSTRUMENTAL ANALYSIS* Instrumental methods of analysis including spectroscopic, electrochemical and separation techniques. Presentation of results from an inquiry-based experiment required. Two hrs lec, six hrs lab per week. Prereq: CHEM 248; and CHEM 336 or con reg. (II)

CHEMISTRY 455/655 - 3 credits - *ADVANCED INORGANIC CHEMISTR*Y Descriptive inorganic chemistry, periodicity of the elements, bonding theories, reaction mechanisms, acid-base theories; and coordination, bioinorganic, and nuclear chemistry. Prereq: CHEM 355; and CHEM 336 or con reg. (II)

CHEMISTRY 499 - 1-3 credits - *INDEPENDENT RESEARCH* Chemistry majors may arrange for independent research with a faculty research adviser. Written report required. Students are encouraged to repeat this course with their adviser. May apply no more than three credits toward ACS certified major. Does not count toward non-ACS certified chemistry major. Prereq: CHEM 248, 326 and consent of chair. (I, II)

SPECIAL CIRCUMSTANCES

The faculty and staff of the Department of Chemistry are convinced that the courses of study for the majors and minors are well formulated and balanced. We expect each student who desires to complete the major or minor to do so as described here and in the University Catalog. We also recognize that special circumstances do arise and the Department will consider such on an individual basis. If you would like to have some requirement waived or changed you may petition the Department to consider your request. Such a petition will normally begin by discussing your situation with your advisor and then the Department Chair. If there is merit in your request, you will be asked to put it in writing for consideration by the entire Department. Remember that your written request will be distributed as is to the entire Department of Chemistry so it should be carefully prepared. Make sure that your circumstances are clearly described and that your request is unambiguously stated. Strive for a good impression by neatly typing and formatting the document. Submit it to the Chair in a timely fashion. The Chair will tell you when the Department will act on your request and when you can expect the results.

RESEARCH IN CHEMISTRY

Chemistry is one of the broadest and most dynamic disciplines in today's world. Our understandings of the physical world are constantly being challenged by new data and theoretical perspectives. Moreover, the techniques available to the chemist in his or her investigations are becoming more sophisticated and precise every day and the application of new methods is becoming crucial to appreciating "state-of-the art" chemistry. For these reasons the Department of Chemistry at UWSP recognizes the importance of involving students in research projects that go beyond typical classroom and laboratory work. Each student contemplating a career in chemistry, whether it be in industry, academia, a government laboratory, or elsewhere, is strongly encouraged to enroll in Chemistry 299, 399, or 499. These courses provide the framework for choosing a research project of interest to the student and allows him or her to gain the crucial exposure to research techniques.

Chemistry 299 is designed to give sophomores (and freshmen in some cases) exposure to research techniques and projects. Chemistry 399 allows more latitude in the project and for this reason is entitled "Independent Study". Students may opt to do projects of personal interest under the direction of a faculty member. Chemistry 499 places emphasis on basic chemical research and requires a somewhat more formal presentation of results in the form of a final paper. In each case, you design the project in consultation with a faculty member and mutually agreeable goals are established. Permission to register for these courses is obtained from the Chair.

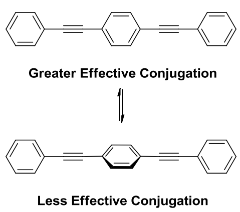
The researcher must learn how to approach the problem, to outline a solution and then modify the program as results are obtained and evaluated. It becomes apparent as the project progresses that chemistry is a tremendously interdisciplinary science and the student hopefully develops the skill of integrating his or her knowledge of various other fields in order to solve the puzzle of the project he or she is engaged in. Clearly, these processes will vary greatly for different students and projects but each student should finish the project with a sense of accomplishment and a deeper appreciation of the scientific method.

FACULTY RESEARCH IN THE DEPARTMENT OF CHEMISTRY

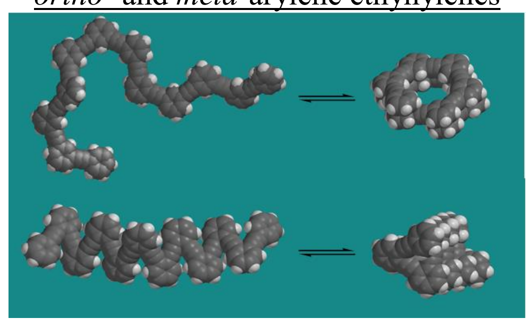
Nate Bowling (Organic Chemistry)

The main focus of our research is developing novel unsaturated compounds in which we can install unique molecular features that give us the ability to control the properties of not only individual molecules but also potential materials made from those molecules.
Rotation around single bonds is an important consideration in all arylene ethynylene research. In *para* systems, bond rotation leads to changes in the effective conjugation and therefore electronic properties of the unsaturated system. Similarly, rotation around single bonds in *ortho* and *meta* systems is necessary for the equilibrium between random coil and helical arrangements. The ability to manipulate *para*-phenylene ethynylene structures provides an opportunity to optimize functionality of organic substrates in next-generation electrical conductors, optical devices, sensors, and an array of other novel organic materials. Similarly, controlling the dynamics of helix formation in the isomeric *ortho*- and *meta*-phenylene ethynylenes provides an avenue for designing higher order molecular structures with valuable functions, such as host-guest chemistry.

para-arylene ethynylenes

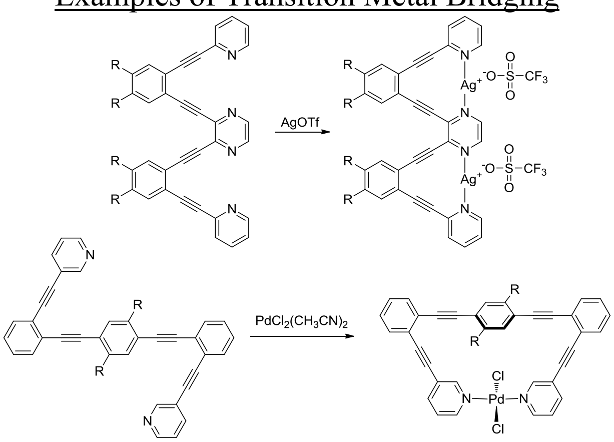


ortho- and *meta*-arylene ethynylenes



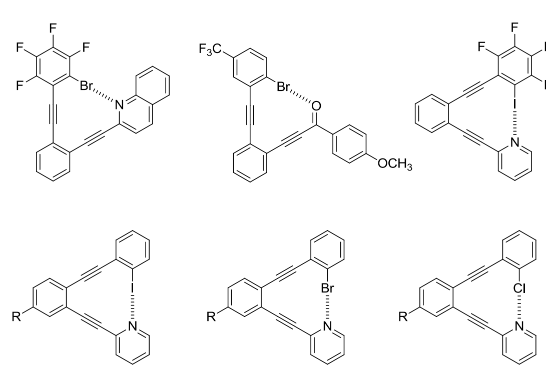
Our primary tools for controlling arylene ethynylene conformation are transition metal coordination and halogen bonding. With coordination, transition metals bridge two different regions of a molecule via attractions to nitrogen lone pairs. These bridges can result in significant changes in electronic properties. Similarly, halogen bond bridges can link two different regions of an arylene ethynylene compound via attractions of halogen atoms to nitrogen lone pairs. In the latter, the arylene ethynylene serves as a framework that allows us to study this lesser known intermolecular/intramolecular force.

Examples of Transition Metal Bridging



R = H or R = $O(CH_2)_9CH_3$

Examples of Halogen Bond Bridging



Laura Cole (Analytical Chemistry)

Bioanalytical investigations using separation methods

Separation methods are a powerful tool for purifying, identifying and quantifying components in complex mixtures. High performance liquid chromatography (HPLC) and capillary electrophoresis (CE) are techniques that my group uses to answer questions about biological samples. HPLC separates materials based on their interaction with a stationary phase, while CE separates materials based on their charge and other characteristics. One recent research project was the determination of melatonin amounts in supplements using HPLC. Other materials that are of interest are metabolites from biological processes and pesticides in environmental or biological samples.

Kevin Czerwinski (Organic Chemistry)

My research group specializes in directed organic synthesis for the purpose of preparing compounds for pharmacological study. The specific aim of our research is to investigate the inhibitory activity of substituted canthin-6-one and canthin-5,6-dione indole alkaloids against human cAMP phosphodiesterase (PDE4) isoenzymes. In the past, canthin-6-one indole alkaloids have been shown to elicit inhibitory activity against bovine PDE4 but the particular molecular features necessary for optimum inhibitory activity against human isoforms are unknown. My research entails three distinct activities: 1) the synthesis of a series of canthin-6-one and canthin-5,6-dione indole alkaloid derivatives, 2) the screening these compounds for inhibitory activity against human PDE4 isoforms, and 3) the development of a three-dimensional quantitative structure activity relationship (3D-QSAR) by computational quantum mechanical methods so as to provide a direction for further study.

Students that work in my laboratories gain expertise in the methodology of synthetic organic chemistry and modern instrumental characterization of natural products by such means as nuclear magnetic resonance (NMR) spectroscopy and infrared (IR) spectroscopy. Students also gain an appreciation of experimental design, monitoring, analysis, and the time it takes to conduct a proper experiment.

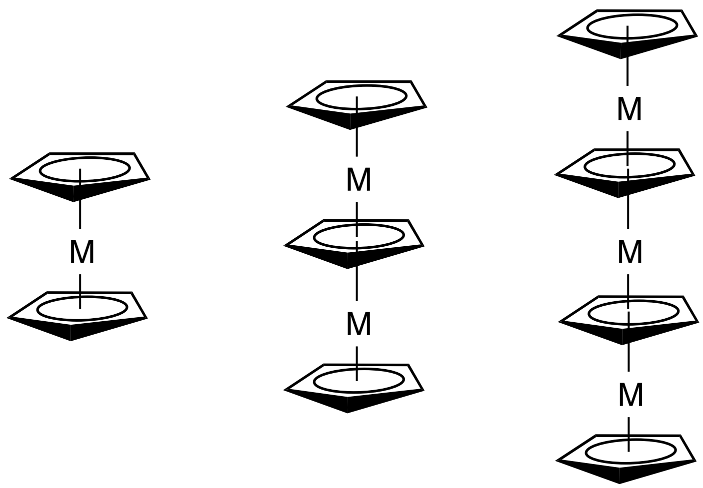
Jason D'Acchioli (Inorganic Chemistry)

Inorganic, organometallic, and computational chemistry

My research group's interests are in inorganic, organometallic, and computational chemistry. We describe some of our research below.

1. Electronic structure of multidecker metallocenes.

Metallocenes have captured the imaginations of synthetic chemists and theoreticians ever since the accidental preparation of ferrocene (**1** below, M =Fe) in 1951. A variety of metallocenes based on complex **1**'s motif has been synthesized over the years, and there has been recent interest in triple-decker complexes such as **2** and the as-yet-unrealized quadruple decker complex **3**. Indeed, what would happen if we hand an *n*-decker complex, a "molecular wire" based on a metallocene motif, extending infinitely in 2-dimensions? How would such complexes be synthesized, and what would their electronic properties be? My group will be collaborating with Professor Eric Watson at Seattle University to attempt to answer those exact questions. Professor Watson's team of undergraduates will be synthesizing novel triple-decker complexes, as well as working towards making a tetra-decker complex. My research group will use density functional theory (DFT) to study the electronic structure of the complexes, both synthesized and imagined, in an attempt to better understand the fascinating chemistry of this group of organometallic species.



1 2 3

M = Fe, Ru, Os, or any combination of the three

2. Theoretical determination of oxidation states.
Oxidation state assignments are critical for explaining the reactivity of compounds in chemical reactions. Even though they are critically important there is no simple, general, agreed-upon way of computing oxidation states from theoretical models. We are in the process of developing a method of determining the oxidation state of transition metals in molecular systems, which we believe will satisfy the aforementioned criteria of "simple" and "general". We utilize quantum chemistry packages including Gaussian09, GAMESS, ORCA, and NBO6, to gather the raw electronic information from these systems. We then utilize the program GNU Octave to analyze the results of the calculations, attempting to gain insight into the oxidation states of the target transition metals.

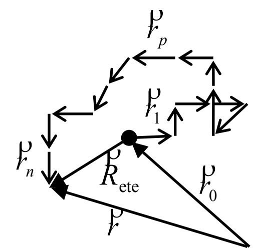
Paul Hladky (Physical / Polymer Chemistry)

A three-dimensional random walk on a cubic lattice is a simple model that describes the configuration of an idealized polymer molecule and the idealized path of a diffusing particle. The similarity between polymer configurations and the paths of diffusing particles means that the mathematical methods that describe random walks can be used to calculate the average sizes and size-related properties of polymer molecules and the temporal and spatial concentration profiles of diffusing particles.

Several mathematical methods that are used to study random walks are described below. Students who enjoy mathematics and like to apply mathematics to chemical problems may be interested in the projects listed at the end.

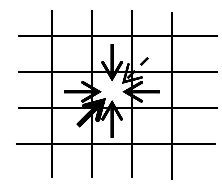
1) The vector model uses a sequence of n vectors, each of length λ, that start at $\vec{r}_0$ and end at $\vec{r}$ with end-to-end vector

$$\vec{R}_{\text{ete}} = \vec{r} - \vec{r}_0 = \sum_{p=1}^{n} \vec{r}_p$$



to describe idealized polymer molecules and diffusing particles. Random walk projects often start with the vector model.

2) Imagine that one end of polymer molecule or a diffusing particle starts in a site at position $\vec{r}_0$. To get to site $\vec{r}$ in n steps means that the $(n - 1)^{\text{th}}$ step was in one of the six nearest neighbor sites. If $G(\vec{r}_0, \vec{r}, n)$ is the number of n-step paths that start at $\vec{r}_0$ and end at $\vec{r}$, then G is given by the recursion relation

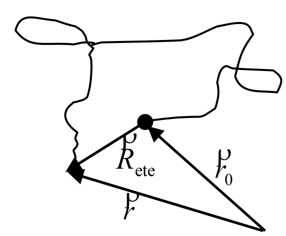


$$G(\vec{r}_0,\vec{r},n) = G(\vec{r}_0,\vec{r}+\hat{i},n-1) + G(\vec{r}_0,\vec{r}-\hat{i},n-1) + G(\vec{r}_0,\vec{r}+\hat{j},n-1) + G(\vec{r}_0,\vec{r}-\hat{j},n-1) + G(\vec{r}_0,\vec{r}+\hat{k},n-1) + G(\vec{r}_0,\vec{r}-\hat{k},n-1)$$

where $\hat{i}, \hat{j}$, and $\hat{k}$ are unit vectors along the $x, y,$ and z axes respectively. Recursion relations can be used to describe polymer molecules in porous solids.

3) The following partial differential equation describing random walks can be derived from the vector model using recursion relations and differential calculus. For a polymer molecule, the solution, P, is the fraction of molecules that start at $\vec{r}_0$, end at $\vec{r}$, and have a contour length $n\lambda$.

$$\frac{\partial P(\vec{r}_0,\vec{r},n)}{\partial n} = \frac{\lambda^2}{6}\left[\frac{\partial^2 P(\vec{r}_0,\vec{r},n)}{\partial x^2} + \frac{\partial^2 P(\vec{r}_0,\vec{r},n)}{\partial y^2} + \frac{\partial^2 P(\vec{r}_0,\vec{r},n)}{\partial z^2}\right]$$



Alternatively, if a large number of particles start at $\vec{r}_0$, then P is the fraction of particles that end at $\vec{r}$ after n steps (in diffusion problems n is equivalent to time and $\lambda^2/6$ is replaced with the diffusion constant, D). This model replaces the discrete vectors with a smooth curve (Gaussian coil).

4) The multinomial expansion that describes random walks in terms of the six possible directions for each random movement (polymer segment position or particle step) is given by

$$(x_- + x_+ + y_- + y_+ + z_- + z_+)^n = \sum_{i=0}^{n}\sum_{j=0}^{(n-i)}\sum_{k=0}^{(n-i-j)}\sum_{l=0}^{(n-i-j-k)}\sum_{m=0}^{(n-i-j-k-l)}\left(\frac{n!\quad x_-^i x_+^j y_-^k y_+^l z_-^m z_+^{(n-i-j-k-l-m)}}{i!\,j!\,k!\,l!\,m!\,(n-i-j-k-l-m)!}\right)$$

This approach allows the vector model to be biased in the sense that the step directions can have different probabilities. Calculating averages from this expression involves partial differentiations.

5) Matrix multiplications can be used to generate all of the configurations of an n-segment polymer molecule or all of the n-step paths of a diffusing particle. For example, one connection between the multinomial expansion and matrix multiplication is shown below

$$(x_- + x_+ + y_- + y_+ + z_- + z_+)^n = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} x_- & x_- & x_- & x_- & x_- & x_- \\ x_+ & x_+ & x_+ & x_+ & x_+ & x_+ \\ y_- & y_- & y_- & y_- & y_- & y_- \\ y_+ & y_+ & y_+ & y_+ & y_+ & y_+ \\ z_- & z_- & z_- & z_- & z_- & z_- \\ z_+ & z_+ & z_+ & z_+ & z_+ & z_+ \end{bmatrix}^{(n-1)} \begin{bmatrix} x_- \\ x_+ \\ y_- \\ y_+ \\ z_- \\ z_+ \end{bmatrix}$$

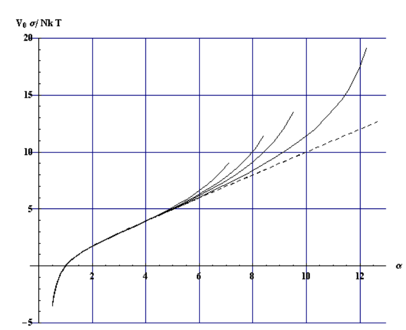
Matrices can also be written for situations that are too complicated for the multinomial expansion and differential equation approaches. For example, all of the possible paths of a random walk that must take a 90° turn at each step or all of the allowed configurations a polymer molecule that has 90° bond angles are generated by the expression

$$\begin{bmatrix} 1 & 1 & 1 & 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 0 & 0 & x_- & x_- & x_- & x_- \\ 0 & 0 & x_+ & x_+ & x_+ & x_+ \\ y_- & y_- & 0 & 0 & y_- & y_- \\ y_+ & y_+ & 0 & 0 & y_+ & y_+ \\ z_- & z_- & z_- & z_- & 0 & 0 \\ z_+ & z_+ & z_+ & z_+ & 0 & 0 \end{bmatrix}^{(n-1)} \begin{bmatrix} x_- \\ x_+ \\ y_- \\ y_+ \\ z_- \\ z_+ \end{bmatrix}$$

which cannot be duplicated by a multinomial expansion. Matrices can also be used to describe the diffusion of particles through porous or maze-like materials.

6) Monte Carlo simulations can be used to estimate properties of polymer molecules by using a computer to generate a sample of polymer molecules (vector model) and then calculate average values of the size-related quantities of interest. If the sample is representative of the actual system, then the average properties of the sample should coincide with the average properties of the system. Monte Carlo methods are useful when systems are too complicated for the other methods. At the same time, the other methods provide ways of testing the accuracy of Monte Carlo simulation programs on simple systems.

<u>Possible Projects - Polymers</u>



a) average sizes of polymers that have only 90° bond angles
b) average sizes of polymers that have intrachain interactions (local and/or nonlocal)
c) random coil ↔ ordered coil transitions
d) equilibrium constants for the partitioning of polymers between bulk solution and porous solids
e) average sizes of polymers that are tethered to solid particles
f) tension - elongation relationships for rubbery materials that show breaking points (solid curves in graph)

<u>Possible Projects - Diffusion</u>

a) comparing solutions for partial differential equations to solutions for matrix equations
b) solutes partitioning between two or more solvent phases

c) small molecules or particles diffusing through layered materials
d) diffusion through maze-like porous solids
e) diffusion controlled chemical reactions

Amanda Jonsson (Biochemistry, Computational)

Using Computational Methods to Explore Protein Dynamics
Human D-amino acid oxidase (hDAAO) is an enzyme found in the brain that is responsible for breaking down the signaling molecule D-serine. hDAAO is composed of two identical subunits that each bind FAD as a cofactor. Increases in hDAAO activity will lead to too much hydrogen peroxide being produced as a product and a decrease in activity will lead to high levels of D-serine. Because of this, mutations in hDAAO are linked to several disorders such as schizophrenia or amyotrophic lateral sclerosis. Some mutations to the hDAAO sequence increase enzyme activity, while others decrease it. We use molecular dynamics simulations to study how differences in the protein sequence alter the dynamics of DAAO.

Undergraduate students working on this project will be exposed to common simulation and analysis software packages. Analyzing simulations will give students a deeper understanding of protein structure and allow them to directly see the impacts of changes in sequence on protein structure and dynamics.

Jim Lawrence (Biophysical Chemistry)

IGFBP-4 Protease Specificity and Mechanistic Research Protein Biochemistry Lab

IGFs are polypeptides with potent mitogenic effects. IGF activity is closely regulated in humans. IGF bioavailability is largely restricted by six distinct IGF Binding Proteins (IGFBP 1-6) (Shimisaki and Ling (1991) Prog. Growth Factor Res. 3, 243-266). These IGFBPs bind IGF and restrict their availability to IGF receptors, hence inhibiting IGF activity. IGFBPs are in turn regulated by a group of proteases which cleave IGFBPs thus releasing the IGFs. IGFBP-4 is an especially interesting protein and has been implicated in several biological roles such as wound healing, bone remodeling and atherosclerotic plaque development. In 1999, while working in Dr. Cheryl Conover's lab I identified the IGFBP-4 protease activity as belonging to Pregnancy-Associated Plasma Protein-A (PAPP-A) (Lawrence *et al*. (1999) Proc. Natl. Acad. Sci. 96, 3149-3153). This discovery was the first to link IGFBP-4 protease activity with fetal development. Despite active research into the mechanism of PAPP-A mediated IGF signaling, intriguing questions remain to be solved. It is unknown how or why PAPP-A specifically recognizes IGFBP-4. PAPP-A may have inherent sequence specific recognition machinery or it may rely on other co-factors for this specificity. In our lab at UWSP, we use an array of protein biochemical tools to try to understand the mechanism of PAPP-A's specificity. We are also working to identify additional substrates which will more clearly reveal PAPP-A's role in fetal development, bone remodeling, ovarian cancer and atherosclerosis.

Kathryn McGarry (Organic Chemistry)

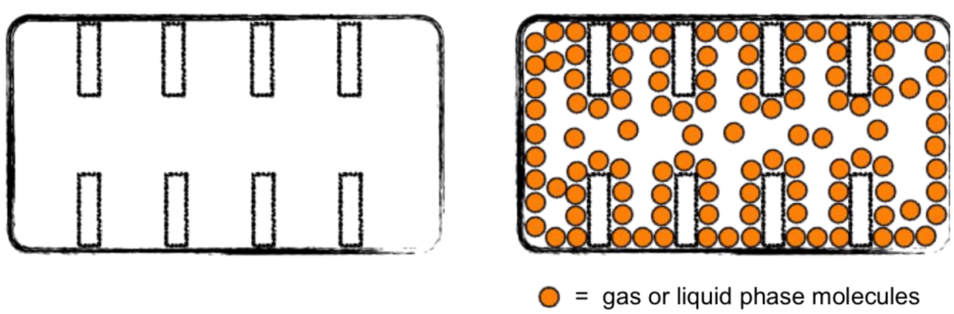
Accessing Nitrogen Heterocycles Through Copper Catalysis

Many biologically active natural products and pharmaceuticals contain nitrogen atoms and nitrogen heterocycles. Improved synthetic methods which introduce nitrogen into a carbon scaffold or achieve formation of a nitrogen heterocycle could provide more efficient access to known molecules or new derivatives that may prove medicinally useful. One such method would be the intramolecular copper-catalyzed aminooxygenation of an amine-tethered alkene substrate. This method would achieve the formation of the ring structure through the creation of a nitrogen–carbon bond and an oxygen–carbon bond across the carbon–carbon double bond in one reaction step. Copper is an attractive catalyst for this process because it is comparatively less expensive and less toxic than other metal catalysts. The use of a metal catalyst also provides the opportunity to potentially generate a stereoselective pathway to the nitrogen heterocycle structure.

Joseph Mondloch (Inorganic & Materials Chemistry)

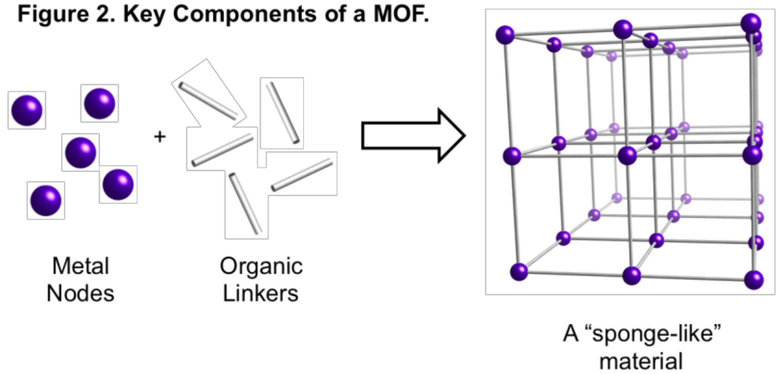
Materials containing void spaces known as porous solids, are capable of functioning as tiny molecular sponges. Gases and liquids are attracted to the internal surfaces of these sponges (see Figure 1) and this property allows them to function as practical materials for gas capture, gas separation, metal capture from solution, and chemical catalysis. Hence, porous materials can be used to capture carbon dioxide, purify medical grade oxygen, remove lead or other contaminants from drinking water, and promote the sustainable production of organic and inorganic molecules.

Figure 1. A Porous Solid without (left) and with (right) gas and liquid phase guests.



From a chemist's perspective, the precise control, or "design", of porous solids has been a long-standing challenge. It can be difficult to construct porous solids that can be tuned for a specific application. Fortunately, by combining metals (*i.e.*, nodes) and organic molecules (*i.e.*, linkers), chemists have recently started to tackle this challenge. The resultant solids, an illustration of which is shown in Figure 2, are termed metal–organic frameworks (MOFs) and they constitute an important and rapidly growing class of porous materials. Very recently MOFs have been commercialized to store and deliver gases for the semiconductor and agricultural industries.

Figure 2. Key Components of a MOF.



We are an inorganic and materials chemistry research group that focuses on understanding the synthesis of MOFs and developing catalysts with unique reactivity for important chemical transformations. Students within the group will receive one-on-one mentoring and learn how to synthesize and modify MOFs, characterize MOFs using powder X-ray diffraction, thermal analysis, and spectroscopic methods (*e.g.,* NMR, IR, and UV-vis), and carry out catalytic reaction chemistry with MOFs.

Shannon Riha (Analytical and Materials Chemistry)

<u>Combating Solar Energy Challenges with Earth-Abundant Thin Films</u>

Renewable energy has gained considerable attention over the last decade in effort to reduce our carbon footprint and protect our environment. Amongst the different forms of renewable energy, solar energy is largely under-represented in the current energy landscape despite its potential. Making solar energy a larger piece of our energy puzzle will require a further reduction in cost, flexibility in design, and most importantly a way to store the sun's energy when it is not shining. Thin film semiconducting materials composed of earth-abundant elements offer a promising solution to combat these challenges. Research in my group focuses on identifying novel materials for solar energy conversion (photovoltaics) and solar energy storage (solar fuels), as well as investigating the effects of synthesis method and post-processing treatments on the physical, chemical, and optoelectronic properties of the material. Students working in my lab will have the opportunity to learn air-free synthetic techniques, thin film deposition methods, and materials characterization methods, including: UV-vis, IR and Raman spectroscopy, scanning electron and transmission electron microscopy (SEM and TEM, respectively), energy dispersive spectroscopy (EDS), X-ray diffraction (XRD), and photo-electrochemistry. In addition, students in my lab often work with students doing research in the physics department to collaborate on measuring electronic and photophysical properties of the materials.

Thin Film Photovoltaics

Copper-based sulfides have a rich history in thin film photovoltaics (PV). Currently, we are investigating copper antimony sulfide, specifically $CuSbS_2$, as a thin film PV absorber material given its elemental abundance, relatively low toxicity, as well as its very suitable optoelectronic properties. In one part of this project, students will synthesize $CuSbS_2$ nanoparticles using air-free synthetic techniques and subsequently deposit thin films from nanoparticle "inks". Post-processing treatments of the thin films (e.g., thermal treatments, ligand exchange mechanisms) will be explored and the effects analyzed with a suite of characterization methods. In another part of this project, students will develop a thin film deposition method based on a layer-by-layer assembly of the cations and anions that make up $CuSbS_2$.

Solar Fuels

Water is considered the "Holy Grail" for solar fuels; using the sun's energy, water can be split into H_2 and O_2, which can then be stored and later used as clean-burning fuels. The material used to promote the water splitting process, called a photocatalyst, must be able to: 1) absorb a significant amount of the sun's energy, 2) have the proper energy levels to promote water splitting, 3) be stable in caustic or alkaline conditions, and 4) be composed of earth-abundant and non-toxic elements. Mixed metal oxides are potentially capable of meeting those requirements but there are over 19,000 ternary oxides and over 200,000 quaternary oxides possible! Students working on this project will use a combinatorial approach to effectively screen multiple photocatalysts for water splitting in order to identify key compositions. After identifying key compositions, students will develop solution-based synthesis methods to prepare larger-scale thin films of the mixed metal oxides for more in-depth analysis.

David Snyder (Atmospheric and Environmental Chemistry)

<u>Particulate Air Pollution</u>

Emissions from the burning of fossil fuels and biomass, along with other human and natural activities, can result in the release and formation of small particles which may contain soot, organic compounds, and toxic heavy metals. The chemical composition of these particles can provide information on their origin and potential impact on human health & welfare and on the Earth's climate. Our group conducts field and laboratory research that is focused on understanding the sources of fine particle air pollution ($PM_{2.5}$) and the exposure of susceptible populations to emissions from these sources.

Real-Time Air Pollution Measurements

Our research group deploys real-time air pollution monitors to understand the spatial and temporal variability in air pollution personal exposure to fine particles. These monitors can be deployed, along with meteorological stations, at stationary locations (Figure 1) or can be used to collect mobile measurements by deploying them on a vehicle (Figure 2) or even in a backpack (Figure 3).

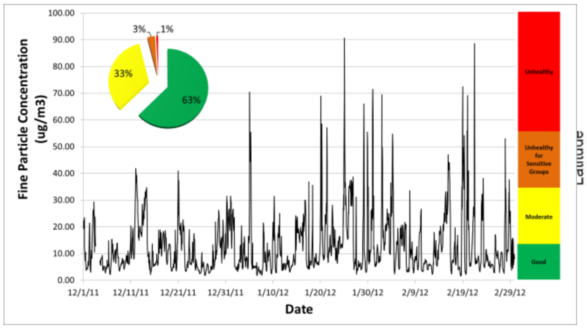


Figure 1: Real-time $PM_{2.5}$ measurements at stationary site

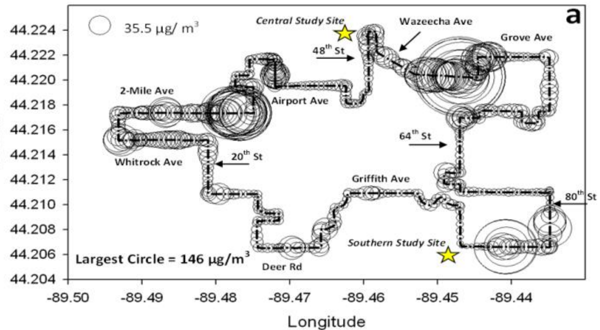


Figure 2: $PM_{2.5}$ data collected using a mobile platform

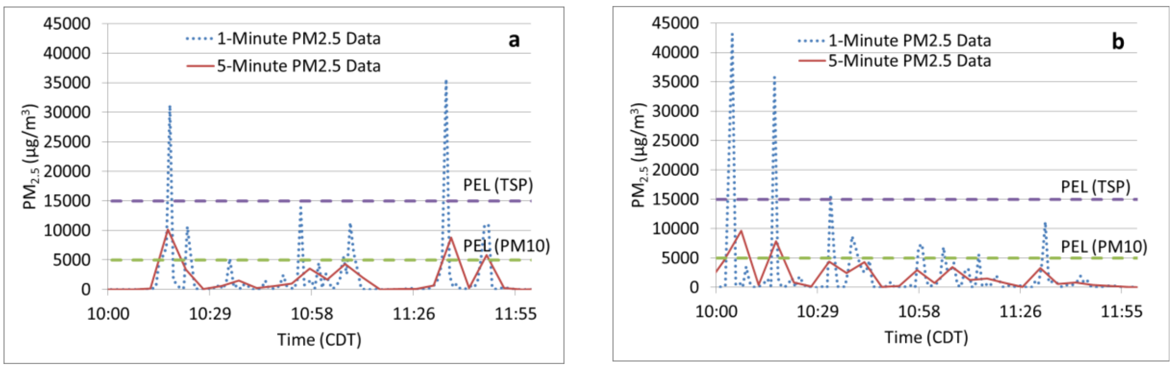
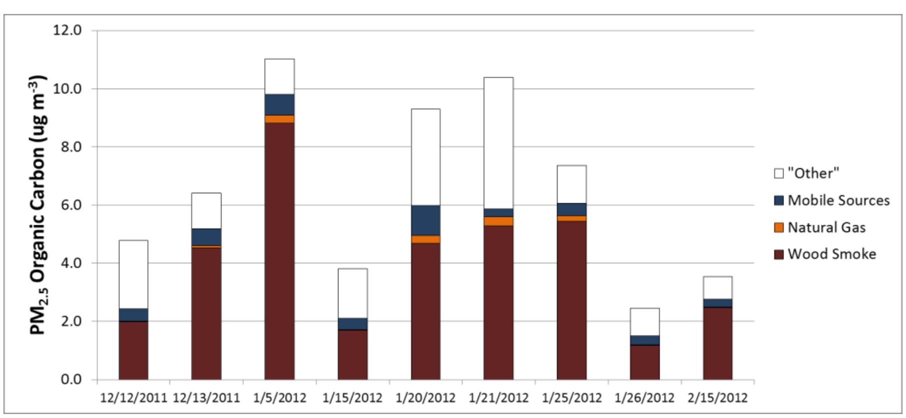


Figure 3a/ 3b: Real-time $PM_{2.5}$ personal exposure measurements. Measurements were taking using an instrument located in the backpack of a firefighter during a prescribed burn.

Source Apportionment of Particle Pollution

In addition to real-time data collection, our group also collects filter-based samples for laboratory analysis. Samples are analyzed for "bulk" chemicals typically present in particulate air pollution and for tracer compounds specific to known sources of air pollution. The concentrations of these tracers, also known as molecular markers, are used to determine the impact of different types of air pollution sources at a study site.

Figure 3: Source apportionment of $PM_{2.5}$ in Grand Rapids, WI



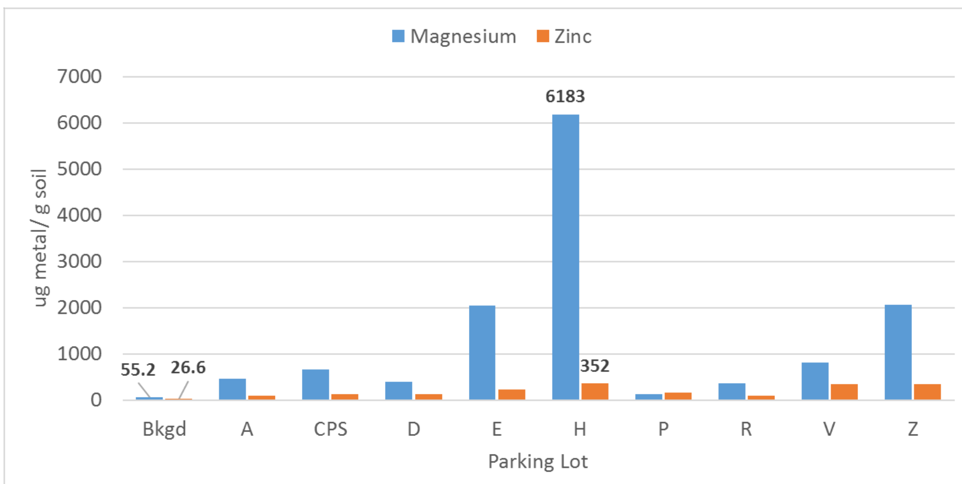
<u>First-Year Student Research Projects</u>

These projects in environmental chemistry are designed to introduce first-year students, including those enrolled in honors general chemistry courses, to the scientific research process and to demonstrate practical applications of knowledge learned in general chemistry courses.

Impact of Road Salts and Vehicle Traffic on Metals in Roadside Soils and Street Sweepings

Road salts, break dust, and engine wear can deposit significant amounts of metals, such as lead and magnesium, along roadsides and parking lots. Our group is working alongside first-year students enrolled in honors general chemistry courses to analyze street sweeping from university parking lots and roadside soils for metals. Techniques used include UV-VIS spectroscopy and atomic absorption and emission spectroscopy.

Figure 4: Magnesium and zinc concentrations measured from street sweepings collected from UWSP parking lots. Background (Bkgd) soil was collected from the UWSP Schmeekle Nature Reserve for comparison. Labeled values represent minimum and maximum measured concentrations.



Erin Speetzen (Biophysical Chemistry)

Molecular Modeling of Flavonoids as Topoisomerase I Poisons

Topoisomerase type I (top I) enzymes play a key role in cell division by creating and subsequently religating single-stand breakages in DNA to relieve torsional strain that occurs during replication. Top I poisons are molecules capable of intercalating into DNA at the breakage site, preventing religation, and leading to cell death, which makes them good starting materials for the development of chemotherapeutic agents. Top I poisons form favorable contacts with DNA base pairs at the cleavage site and with nearby amino acid residues. The orientation of the poison within the DNA is dictated by the interactions with the DNA, while mutations of amino acid residues near the active site lead to drug resistance. Research students in my group are working on using density functional theory, ab initio- and fragment-based methods to explain the experimentally determined structure activity relationship for the binding of flavonoids to the top I/DNA cleavable complex and to determine which amino acid residues may be important for resistance to flavonoids. Flavonoids, which are naturally occurring antioxidants, have been found to act as top I poisons in cell lines and organisms that show resistance to commonly used top I poisons and therefore may provide an important starting point for the development of novel top I poisons.

Research in the Speetzen group will introduce students to a variety of quantum mechanical methodology including both density functional theory and *ab initio* and fragment-based methods. In addition, students will gain familiarity with Unix and with Gaussview, Gaussian, and GAMESS software packages and will gain an appreciation for structure-based drug design.

David Szpunar (Physical Chemistry)

<u>Velocity Map Imaging of Atmospherically Important Radicals and their Photolytic Precursors</u>

My research interests lie in the area of photodissociation dynamics. This field of study examines the details of reactions that involve the rupture of a bond following the absorption of light. In particular, the field of photodissociation dynamics hopes to answer questions such as, how does the absorbed photon break the bond? What is the lifetime of the species upon absorption of the photon? What are the main fragments that the molecule breaks into? How is the energy of the photon partitioned to the fragments?[1] Can the newly-produced fragments go on to dissociate (break apart) themselves (i.e. can the fragments undergo secondary dissociation)?

In my lab, we focus on the energetics of these secondary dissociation processes. We use photodissociation of a halogenated species to form radical intermediates found in atmospherically important reactions.[2] These newly-formed radicals then undergo secondary dissociation. The experiments can shed light on the barrier heights in these atmospherically important reactions, as well as the inter- and intramolecular forces involved in these reactions.

Briefly, a molecular beam of these halogenated radical precursors is crossed with the output of an ultraviolet laser to initiate dissociation, producing the halogen atom (^2P_j) and its momentum-matched radical fragment. The nascent halogen atoms are selectively ionized using resonance enhanced multiphoton ionization (REMPI), and detected using the velocity map imaging (VMI) technique.[3] The translational energy distribution ($P(E_T)$) derived from these halogen atoms is then calculated, yielding insight on the primary photodissociation reaction. Any nascent radical fragments are examined using VMI with vacuum ultraviolet (VUV) photoionization at 118nm. Due to momentum-matching, the resulting $P(E_T)$ derived from any stable nascent radicals should be identical to that derived from the halogen products. Any radicals that are not stable (i.e. have energies exceeding any barrier heights to dissociation) will dissociate and not be represented in the radical-derived $P(E_T)$. In other words, high-velocity radicals (with low internal energies) will be represented, while those slower radicals (with higher internal energies) will not be represented. Determining where the halogen-derived and radical-derived $P(E_T)$s diverge signals the translational energy at which radicals become unstable. Energy conservation is then invoked to determine at which internal energy the radicals become unstable, yielding the barrier height.

1. R. Schinke, *Photodissociation Dynamics*, Cambridge University Press, New York, NY (1993)
2. J. Phys. Chem. A **115** 14559-14569 (2011); J. Chem. Phys. **131** 044304 (2009).
3. *Rev. Sci. Instrum., **68** 3477–3484 (1997)*

Robin S. Tanke (Organic/ Homogeneous catalysis/ Outreach)

Iron Complexes as Catalysts for Hydrosilylation Reactions

In the past, iron complexes were typically passed over as potential catalysts because iron easily oxidizes to an inactive state. Recently, however, iron complexes have been shown to be effective catalysts for a variety of reactions that are have been catalyzed by expensive metals like ruthenium, osmium, rhodium, iridium, palladium or platinum. Since iron is one of the most abundant elements on earth, processes involving iron are considered inexpensive, sustainable and generally non-toxic. We are looking at hydrosilylation reactions because organic silanes are found in a variety of products including lubricants, adhesives and coatings.

Students involved in these projects will learn inert atmosphere techniques and use nuclear magnetic resonance, infrared and absorption spectroscopy, as well as X-ray diffraction and mass spectrometry to characterize products. Furthermore, students will make presentations locally and regionally.

In addition to traditional research projects, I also mentor students, usually education majors, interested in offering a “Chemistry at UWSP Day” for high school and middle school students.

Tony Timerman (Biochemistry)

My research interests include the biochemistry and biophysics of integral membrane proteins. Specifically, my experience relates to the isolation and characterization of the ryanodine receptor, which is the intracellular calcium release channel of rabbit skeletal muscle sarcoplasmic reticulum. The ryanodine receptor plays an important role in muscle excitation-contraction coupling. Excitation-contraction coupling refers to the series of events beginning with stimulation (excitation) of a muscle fiber which concludes with shortening of the fiber length (contraction). Muscle contraction is triggered by a rapid increase in the concentration of calcium ions bathing the contractile proteins. In skeletal muscle, the calcium ions used to trigger contraction are stored in a specific intracellular compartment called the sarcoplasmic reticulum and the ryanodine receptor serves as the calcium release machinery of sarcoplasmic reticulum which triggers muscle contraction! Projects in this area may introduce students to strategies and techniques of tissue fractionation, protein purification, methods of monitoring ion channel activity, and immunomethods utilizing antibodies as probes in biochemical investigations.

UWSP CHEMISTRY DEPARTMENT FACILITIES

The Chemistry Department at the University of Wisconsin-Stevens Point occupies approximately 35,000 sq. ft. in the 185,000 square foot Science Building constructed in 1963, expanded in 1972, and remodeled in 1987, 1994, and 2001. In addition to fully-equipped teaching laboratories, modern research laboratories are available for faculty members and undergraduate researchers. The Department has a large chemical stockroom.

Chemistry Department Computer Laboratory (A113) This room houses the departmental instructional computer lab, which is equipped with Macintosh computers capable of running MacSpartan molecular modeling software, Mathematica mathematics program and ChemDraw industry standard structure drawing software in addition to the standard Microsoft suite of word processing/spreadsheet applications. High speed internet access and integration with the campus email and other network facilities are also available. Chemistry course materials, such as sample quizzes, tests, problem sets, study guides, textbooks and reference materials are placed here by many chemistry faculty. Public hours for the room are posted by the door and typically start the second week of classes. Chemistry majors enjoy the privilege of after-hours access to this facility for study and group meetings.

See the Stockroom Manager for the necessary paperwork for obtaining keys.

Instrumentation

The Department of Chemistry possesses a wide-array of modern, sensitive instruments for chemical analysis. All of these instruments are used by students in their classes and research. We place a high priority on students acquiring hands-on experience with modern instruments. Instrument holdings include:

- Bruker Avance III 400 MHz Superconducting NMR Spectrometer
- Agilent Model 6520 Liquid Chromatograph with a QTOF Mass Detector
- Agilent Model 1200 Gel Permeation Chromatograph with Laser Light Scattering, Refractive Index, and Viscometry Detectors
- Agilent Technologies 6870N Gas Chromatograph with a 5973 Mass Detector
- Agilent 1100 Series High Performance Liquid Chromatograph
- Perkin-Elmer AAnalyst 100 Atomic Absorption Spectrophotometer
- Perkin-Elmer Optima 3100-XL Inductively Coupled Plasma Spectrometer
- Cary 300 Conc UV-Visible Spectrophotometer
- Jasco 460 Plus Fourier Transform Infrared Spectrometer (x 2)
- Aminco-Bowman Series 2 Luminescence Spectrometer
- Perkin-Elmer Pyris 1 Differential Scanning Calorimeter
- Perkin-Elmer Pyris 1 Thermogravimetric Analysis System
- Laser/Spectroscopy Laboratory: Nitrogen Pumped Dye Laser and Argon-ion Laser
- Computer Laboratory with 13 Power Macintosh Computers

- Braun MB-SBS Two Solvent Purification System (x 2)
- Altix CMN024 Computer Cluster
- Ambius EIU Atomic Force Microscope

These instruments provide a modern and technologically advanced environment in which to learn up-to-date chemistry skills and to perform fundamental research. We are also very well equipped with traditional teaching equipment such as: gas chromatographs; electronic balances; pH meters; spectrometers for routine analyses in laboratory; specialty glassware; high temperature ovens; etc. The Department has glass repair and simple fabrication capabilities and access to a complete machine shop. Electronic equipment is maintained by a full time electronics specialist.

AWARDS

The Chemistry Department administers several awards to recognize outstanding student performance in the chemistry curriculum. The recipient of each award is, in general, decided via a nomination and balloting process by the faculty of the Department. Awards are presented annually in the later portion of the Spring semester. Funds for these awards come from contributions. A quick summary of the awards follows.

College of Letters and Science Outstanding Student Awards (a plaque) Awarded to one graduating senior (biochemistry major) and one continuing student (chemistry major) based upon above average achievement in the major; ability to write and speak effectively; interest in exploring a variety of academic areas demonstrated by earning a significant number of credits outside the major; demonstrated intellectual curiosity and possession of sufficient confidence in his/her knowledge and analytical ability to challenge, in appropriate instances, oral and written arguments.

Culver-Rogers Award (amount varies) Presented to the second semester junior with the highest grade point average in biochemistry, biology, chemistry or physics.

Faust Freshman Award ($250) Presented in memory of Gilbert Faust, a long-time member of the chemistry department and Registrar, for outstanding performance in freshman chemistry by a major

Faust Sophomore Award ($250) Presented in memory of Gilbert Faust, a long-time member of the chemistry department and Registrar, for outstanding performance in sophomore chemistry courses by a major.

Kallander Award for Physical Chemistry ($250) Presented in memory of Larry Kallander, a former member of the chemistry department, for outstanding performance in physical chemistry.

Kallander Award for Inorganic Chemistry ($250) Presented for outstanding performance in the study of inorganic chemistry.

Megal Sophomore/Junior Award (amount varies) Provided for by a gift from a graduate of the chemistry department, Carolyn Megal, for outstanding performance by an undergraduate woman majoring in chemistry.

Merck Index Outstanding Student Award (Copy of the Merck Index) Presented by the department on behalf of the Merck Company to an outstanding chemistry major.

POLYED Organic Chemistry Achievement Award (Certificate) Presented to the student with the most outstanding performance in sophomore organic chemistry on behalf of POLYED, the joint education committee of the ACS Divisions of Polymer Chemistry and Polymeric Materials

Trytten Freshman Award ($250) Presented in memory of Roland Trytten, long-time chair of the chemistry department, for outstanding performance in general chemistry by a major.

Trytten Sophomore Chemistry Award ($250) Presented in memory of Roland Trytten, a long-time chair of the department, for outstanding performance in sophomore chemistry by a major.

Undergraduate Award in Analytical Chemistry (Certificate and monthly emails from *Analytical Chemistry* with highlights from journal) Presented on behalf of the *ACS Division of Analytical Chemistry* to a student who has completed at least three years of study and who displays an interest in and aptitude for a career in Analytical Chemistry.

Undergraduate Award in Inorganic Chemistry (Certificate and a letter of commendation signed by the Chair of the *ACS Division of Inorganic Chemistry*) Presented on behalf of the *ACS Division of Inorganic Chemistry* to a chemistry major who has demonstrated excellence in inorganic chemistry and a desire to pursue a career in chemistry.

Undergraduate Award in Organic Chemistry (Certificate and a letter of recognition from the *ACS Division of Organic Chemistry*) Presented on behalf of the *ACS Division of Organic Chemistry* to a graduating chemistry or biochemistry major who has demonstrated excellence in organic chemistry based on a combination of research experience, coursework and a desire to pursue a career in chemistry.

Undergraduate Award in Physical Chemistry (Certificate from the ACS Division of Physical Chemistry; Recognition on the Division's website; One-year complimentary membership in the Division of Physical Chemistry.) Presented on behalf of the ACS Division of Physical Chemistry to recognize outstanding achievement by undergraduate students in physical chemistry, and to encourage further pursuits in the field.

Weaver Award ($250) Given in honor of professor Robert Weaver, a long-time chair of the chemistry department, for outstanding performance in biochemistry by a major.

SCHOLARSHIPS

The Chemistry Department offers scholarships that are announced early in the spring of every year. Applications may then be obtained from the Department Office (D129 Science). Please see the annual announcement and descriptions below for more details.

Bondeson Excellence in Research Scholarship

This scholarship was established in memory of Stephen Bondeson, a former student and faculty member, and consists of a monetary award which will be applied toward tuition. It is presented to a junior-level chemistry or biochemistry major who is involved in a research project under the mentorship of a UWSP faculty member.

Fuqua Memorial Scholarship

This scholarship was established by the family of Peter Fuqua, a 1971 graduate of our department and consists of a monetary award which will be applied toward tuition. It is presented annually to a junior chemistry major in recognition of academic accomplishments and of involvement in campus and/or community activities including support for the needy.

Hansen Memorial Scholarship

This scholarship was created in honor of William C. Hansen, a 1911 UWSP graduate and the 7th chancellor of UWSP (1940-1962), and consists of a monetary award which will be applied toward tuition. It is presented to a deserving chemistry or biochemistry sophomore.

Kaczmarek Scholarship

This scholarship was created by an endowment from Gilbert J. Kaczmarek, a graduate of our department, and consists of a monetary award which will be applied toward tuition. It is presented to a junior chemistry major for distinguished achievement in academics, leadership and a demonstrated potential for success as a chemist.

Thalacker-Trytten Scholarship

This scholarship was established by Victor Thalacker, a graduate of our department, in memory of his professor and mentor Roland Trytten and consists of a substantial monetary award (the amount varies) which will be applied toward tuition. It is presented annually to a high-achieving undergraduate student majoring in either Chemistry, Physics or Mathematics.

Wisconsin Chemistry Student Scholarship

This scholarship was established by an anonymous donor in 2008 and consists of a monetary award which will be applied toward tuition. It is presented annually to a deserving junior or senior chemistry major who resides in Wisconsin.