Self-Study for Program Review

BS Chemistry

MS Chemistry

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1 Executive Summary

1.1 Reflections from the process

A self-reflection of an academic program requires thoughtful consideration of many aspects the department in which it is housed. From the curriculum to the scholarly activities of the faculty to the quality of the students, a careful, introspective view is needed to develop and grow. This self-study is an attempt to ascertain both the strengths and weaknesses of the BS and MS chemistry programs. In previous years, assessment of our programs has not been a priority. However, the recent formation of an assessment committee has brought the significance of assessment protocols to the forefront. This committee, consisting of four tenured faculty (including the department and associate department head), one tenure-track faculty member, and one instructor, has considered seven standards (detailed below) put forth by the Office of Institutional Planning and Effectiveness. Reflections were compiled and presented to the entire faculty for review, and what follows is a summary of our findings. We found that, through this process, not only were strengths and weaknesses identified, but suggestions for improving the quality of our programs were plentiful. We recognize that these introspective discussions are a healthy means to continue to develop and grow, and the committee will continue to use these discussions, as well as the feedback from external reviewers, and an assessment plan to continue the development process for several years to come.

1.2 Summary of key findings from Response to Standards

The BS and MS chemistry programs attract high quality students. Incoming freshmen and transfer students that declare chemistry as a major typically have higher qualifications than other incoming students. Fortunately, we are able to offer these students a high-quality education through hands-on research experiences, one-on-one faculty-student interactions and direct access to sophisticated instrumentation. The quality of their education shows in their chemistry-related job or academic placement. At least 69% of the BS students and 85% of the MS students from the last three years are pursuing chemistry-related endeavors.

Our aim is to further develop the high quality curriculum we provide, and we have begun by revising our undergraduate curriculum to provide a more coherent and rigorous "core" of courses with prerequisites that help to better prepare students for advanced coursework. However, in some concentrations (specifically the pre-professional track), more work is needed since the rate of student acceptance into medical, dental and veterinary schools is low. More credit hours need to be added to the major, and the rigor of some courses needs to be increased to make our students more competitive. Along those lines, we would like to be able to add required 600-level coursework for our MS students.

The research faculty in our programs are very active scholars, providing one-on-one research opportunities for both undergraduate and graduate students. In fact, approximately 40% of our undergraduate majors are involved in research projects for *two or more* semesters. The faculty also apply for grants regularly and, since 2007 have secured over $1.2 million in external funding. Nonetheless, the extent to which we can offer research experiences and our research productivity itself are hampered by limited resources and the physical limitations of our aging facility. The current budget model does not provide sufficient funds for improvement or growth of the department, particularly in the area of instrumentation. While the department houses many sophisticated instruments, several are older models that need to be rotated out of the labs and replaced with more current systems. Additionally, software used to interface with instrumentation needs to be upgraded, but that cannot be accomplished without first upgrading the computers themselves.

Our undergraduate program is growing rapidly. We currently have 51 junior and senior chemistry majors, the highest number in four years, and the total number of chemistry minors has grown from 39 to 67 during that time. This increase, along with increased enrollment in other disciplines that require chemistry courses, has made it quite challenging to staff our courses. We have had to reduce the offering of some liberal studies courses in order to cover courses required by majors (ours and others). We may not be able to continue to cover these required courses in the future if enrollment continues to grow without the provision of additional resources. A recent change of counting 100-level lab courses as *partial* credit toward an instructor's load has helped slightly to cope with the enrollment growth, but instructors of these courses are now unfairly required to teach more courses to fulfill their load requirement. Additional staff in physical and/or biochemistry would relieve some of the enrollment pressure in lower-level courses, and the program would benefit greatly from a staff or teaching position that was responsible for coordinating 100-level lab sections.

Another mechanism to deal with enrollment growth is to have more graduate teaching assistants to cover lab sections. We currently have 11 graduate students in our MS program, which is comparable to enrollment at most of our Carnegie peer institutions, but is a little low due to a recent increase in academic standards used for admission. We would like to increase the size of our program to about 15 students, which would help with enrollment and also improve the research productivity of our program. However, this goal is challenging to reach since, in our discipline, many highly-qualified students pursue a PhD (rather than an MS) directly upon graduating with a Bachelor's degree. Also, our program is unable to provide any form of tuition assistance for in-state applicants. Only two out-of-state tuition waivers are available, and recipients are still responsible for the in-state portion of the tuition. Consequently, students attending our MS program must often rely on student loans or other sources of financial support. To improve enrollment in our graduate program, the department is currently discussing new methods for improving our marketing and recruitment efforts.

The administrative load in our programs is well-distributed among a department head, an associate department head, and a graduate program coordinator, an administrative support associate, a research operations manager, and several student-workers. Nonetheless, because of the complex nature of our department (many programs, faculty and students, extensive purchasing requirements, etc.), we require and plan to request an additional half-time position for an administrative support associate. Additionally, the research operations manager is an employee for the entire college and his duties are split among three science departments. We feel that the responsibilities for our programs alone warrant a dedicated position within our department.

2 Response to Standards

2.1 Standard 1: The purpose of the program reflects and supports the mission and strategic vision of Western Carolina University and the mission of the College of Arts and Sciences.

2.1.1 Program Purpose

Both the BS and the MS programs in chemistry serve several purposes detailed in Appendix A.2. In summary, our goals are to prepare students for future careers in chemical-related industries or graduate programs and to teach students to think critically and solve problems. We also provide educational support to other disciplines such as health-related fields, engineering, and other science programs.

2.1.2 Alignment with University Mission

These goals are well-aligned with the missions and strategic vision of the university (see Appendix A.1). We use engaged learning opportunities by providing one-on-one research experiences for both undergraduate and graduate students. **These experiences provide hands-on training in analytical thinking that prepare students for science-related careers and graduate programs upon graduation.** Additionally, our service to other disciplines, including the offering of liberal studies courses, fits well with the mission of the College of Arts and Sciences (Appendix A.1) to provide a broad range of human experience, knowledge and expression.

2.1.3 Program Distinctions

Our programs are distinctive in that **students receive one-on-one faculty-student interactions**, both through impromptu meetings regarding coursework or advising and through research experiences. These interactions provide students with the opportunity to truly engage in the science taught in the classroom. Additionally, **students have direct access to sophisticated instrumentation** which is not always available at other institutions.

2.2 Standard 2: The program engages in ongoing, systematic planning that is reflective of the university's strategic priorities.

2.2.1 Strategic Goals

Strategic goals for the BS and MS programs are provided in the department's Strategic Plan (Appendix B.2). Highlights are listed below and are aligned with the program purpose described above and in Appendix A.2.

BS Program

- Train students to become critical thinkers
- Train students to become effective communicators
- Prepare students for employment in the current economy
- Increase opportunities for pursuing biochemical studies
- Improve advising for preprofessional students (premed, pre-dentistry, etc.)
- Provide improved resources for job and graduate school placement
- Improve information stream for chemistry-related extra-curricular activities (REU, internships, etc.)

MS Program

- Train students to become critical thinkers
- Train students to become effective communicators
- Prepare students for employment in the current economy
- Increase opportunities for pursuing biochemical studies
- Improve the rigor of the program by including non-crosslisted 500-level and more 600-level courses
- Increase enrollment slightly

- Increase the number of applicants to the 4+1 program
- Improve recruitment and retention of highly-qualified students
- Consider forming a central focus for the program
- Explore potential for interfacing with other in-state programs

2.2.2 Planning Process

Implementation of the strategic plan centers on the formation of an assessment committee (described in Appendix B.1). This committee will meet several times per semester to address the strategic goals and develop plans for their implementation. After discussion amongst the committee members and other departmental committees, plans will be discussed by the entire faculty and, upon acceptance, will be implemented by volunteers that may or may not be part of the assessment committee. The assessment committee will follow-up on plans and use data to complete annual assessment reports and to revise goals, when necessary. A means to include student input in the strategic planning process has yet to be identified. However, exit interviews of graduating students and a small group analysis of the Master's program are being used (Appendice E.11 and E.12, respectively), and their feedback will likely play a critical role in the development and modification of goals and objectives.

2.3 Standard 3: The program provides and evaluates a high quality curriculum that emphasizes student learning as its primary purpose.

2.3.1 Curriculum Development Process

The overall chemistry curriculum is developed through a departmental curriculum committee. This group, consisting of 5-7 faculty at all ranks, meets several times per semester to work on particular curricular issues. (Some current projects are described below.) Any proposed changes to the curriculum are brought forth to the entire faculty at regularly scheduled faculty meetings for discussion and a vote. The curriculum committee is charged with carrying out any changes to the curriculum by creating proposals that go through a chain of college- and university-level curriculum committees for approval. An assessment committee (5-7 faculty of all ranks) has recently been formed to both guide the projects of the curriculum committee as well as to determine the effectiveness of implemented curricular changes.

2.3.2 Curricular Alignment With University Mission

Our department is interdisciplinary in nature, given that we house several programs besides chemistry: physics minor, forensic science and environmental science. We also offer a variety of interdisciplinary upper-level electives (CHEM 330 - aquatic chemistry; CHEM 361 - biochemistry; CHEM 461/561 - environmental chemistry; a new environmental organic chemistry course; and CHEM 465 - forensic chemistry).

The chemistry curriculum aligns well with university needs by offering a liberal studies (LS) course (CHEM 101). We also offer some 100- and 200-level chemistry courses required by other disciplines (forensic science, nursing, engineering technology, emergency medical care, biology, geoscience, and others). Due to increased enrollment in some of these courses (particularly CHEM 132, 133, 139, 140, 241, 242 and 272, see Appendix C.4) **we've had to decrease the offering of some other courses that fulfill liberal studies requirements**. For instance, we used to offer multiple sections of CHEM 19x, which satisfies the first year seminar requirement of the LS program, quite regularly. We no longer offer any of these courses, since we are barely able to staff courses required for some other majors on campus.

2.3.3 Recent Curricular Revisions and Current Projects

Over the past year and a half, the department has worked to streamline the undergraduate curriculum, reducing the number of concentrations from eight to four: American Chemical Society (ACS) approved; four-plus-one, which is also ACS-approved but includes graduate-level coursework and more research courses such that students can presumably complete a Master's degree with only one additional year; premedical and biomedical science and technology, which includes many biology electives and is intended to prepare students for medically-related professional graduate programs or a career in biochemistry; and a general concentration, which is similar to a B.A. degree but does not require a foreign language component.

As part of these curricular changes, **a more coherent and rigorous "core" of courses was created** (see course catalog and checksheets in Appendices C.1 and C.2, respectively), and suggestions for appropriate electives have been provided. A comparison of peer institutions' course offerings was used to guide the requirements for each degree. However, many programs require 70+ credit hours in the major, particularly for premed tracks. At WCU, the maximum allowed hours in the major is 65, so not all of our proposed changes were approved by various campus curriculum committees. In some instances, we were able to get an exception which allowed us to increase the number of hours to 68. While this is a significant improvement to the quality of our programs, still **more hours are required to provide a thorough education for our students that will make them competitive with graduates from other programs**.

In addition to increasing the number of total number of credit hours in the undergraduate curriculum, we feel **we need to improve the overall rigor of our courses**, particularly at the

100-level as well as at the graduate level. A more rigorous course at the 100-level would provide a strong foundation for students moving through the program, but may result in more student failures and/or students changing their major from chemistry to something else. Also, increasing the rigor in these courses would have a large impact on other disciplines since many majors require 100-level chemistry as part of their curriculum. To date there have been no discussions with other departments that require these courses regarding their views of the strength of these courses, so dialogues need to be opened. Conversations among instructors that teach multi-section courses (mainly 100- and 200-level courses) also need to take place so that course requirements are more uniform for each section. This occurs to some extent, but has not been formalized, and consequently, there are some significant differences among student experience. (e.g. Some instructors have three exams, others offer four and drop one; some instructors give more weight to the lab component than others; some instructors are generally "harder" than others.) The curriculum committee has begun discussions on ways to unify these courses (e.g. common exam questions, common syllabi, etc.). The overall rigor of these courses is part of that discussion.

At the graduate level, recent curricular changes have also taken place. Previously, students were allowed to take any graduate-level courses to fulfill the required number of courses. In the last three years, that has changed so that students are required to take chemistry courses that span the range of sub-disciplines, selecting from physical, organic, inorganic, analytical and biochemistry. All of the graduate courses we offer are 500-level courses that are cross-listed with 400-level undergraduate courses. To distinguish the undergraduate experience from the graduate experience, graduate students are asked to do additional work, as directed by the instructor. This typically comes in the form of a paper or small research project. The only 600-level (graduate only) courses offered are seminar and research. **We would like to be able to offer (or possibly require) some 600-level courses to improve the quality of education of our graduate students.** However, these would likely be under-enrolled courses, and we would require special exceptions to be able to offer them. Nonetheless, this would improve the quality of our MS program.

Until recently, the organization of our courses in both the undergraduate and graduate programs has been based on historical precedence. However, with the recent revisions in the curriculum, many changes have been made to improve the logic behind the curriculum. Specifically, discussions in the curriculum committee have been underway to determine what topics are covered in each course to ensure that all the necessary topics are covered to the appropriate extent so that students are able to achieve the learning outcomes (Appendix C.11) set forth by our Assessment Plan (Appendix C.9) and reviewed in our Annual Assessment Reports (Appendix C.10). However, we've found that **learning outcomes are poorly defined and not easily assessed, making it difficult to determine if the current curriculum is designed to meet specific objectives.** Discussions of curricular content and learning outcomes will continue in both the curriculum and assessment committees. Well-defined learning outcomes will also aid in the universal inclusion of course objectives on syllabi, which is currently lacking (see Appendix C.3). Nonetheless, even without concrete assessments, we feel our graduating students excel in the learning outcomes we've set for ourselves such as critical thinking skills and communication skills. (See Appendices C.8 and C.12.)

As part of the curricular revisions within the undergraduate program, prerequisite requirements have been adjusted to more accurately reflect the needs of the courses. We've also added the requirement of a C or better for most prerequisites, ensuring that, **as later courses in the sequence become more challenging, students are better prepared and able to succeed.**

2.3.4 Advising

Adherence to co- and prerequisites has improved over time with the aid of more concrete 8-semester plans (Appendix C.7) and better advising. With the current frequency of course offerings (Appendix C.4), graduate and traditional undergraduate students have generally been able to complete their degrees in a timely fashion (see Appendix C.6). However, transfer students, particularly those with an Associate's degree, often have difficulty finishing in four semesters because they lack many entry-level courses that are prerequisites for upper-level coursework. **An improved advising plan for transfer students needs to be established, and improved communication with local community colleges about curriculum design for science majors could help to make students better prepared for entry into a 4-year college.**

2.4 Standard 4: The program has sufficient faculty resources to meet its mission and goals.

2.4.1 Composition of the Faculty

The chemistry program is housed in a positive and productive work environment. We are a collegial group of six tenured and six tenure-track faculty, two instructors, and two lecturers, for a total of 16 full-time faculty. We also employ one part-time adjunct faculty. The composition of the faculty is summarized in Appendix D.1. All tenured, tenure-track professors and instructors have PhDs and the lecturers have MS degrees from accredited universities. These credentials are consistent with the requirements of the Southern Association of Colleges and Schools (SACS).

Currently, we have faculty that specialize in all the traditional "divisions" of chemistry (analytical, organic, inorganic, physical, and biochemistry). However, we have significantly more analytical and organic faculty than in other sub-disciplines. (See Appendix D.2.) While greater numbers in these specialty areas are needed for instruction in the 100- and 200-level courses, we fall short in the other areas. **Additional staff in physical and/or biochemistry would not only relieve some of the enrollment pressure in 100- and 200-level courses, but would also enable us to offer more special topics and specialized graduate level courses.** Hiring these professionals would also increase the diversity of research opportunities for our students. (More students are interested in biologically-relevant research experiences than one biochemistry professor can provide.)

2.4.2 Teaching Loads

Course loads for individual faculty members are listed in Appendix D.8. The course load for tenured/tenure-track faculty is 9 hours/semester, and for full-time lecturers and instructors, it is 12 hours/semester. Typically, one contact hour is worth one hour of load so that, for example, two lectures (each meeting 3 hours/week) and two labs (each meeting 3 hours/week) would be a complete load for a lecturer or instructor. However, a new strategy was implemented by the college in 2010 to improve course coverage. In 100-level lab courses, the new formula counts only 75% of each contact hour towards an hour of load. The result is that **a faculty member must teach more courses to achieve the required load**. This formula has the greatest impact on lecturers and instructors who teach 100-level courses. These faculty are now required to teach 3-4 lab sections (depending on if the lab meets for 2 or 3 hours/week) in addition to 2 lecture courses resulting in roughly **15 contact hours/week**. (Previously, they were teaching a maximum of 12.) While this does help the department to cope with increasing enrollment, we feel this has shifted an unfair burden to the non-tenured/tenure-track faculty. Additionally, these faculty members are responsible for coordinating multi-section laboratories, a duty for which they are currently not receiving any teaching credit unless they are coordinating more than ten lab sections for a course. **The department would benefit greatly from a staff or teaching position that could handle these extra coordination duties** which include preparation of chemicals, working with teaching assistants, and maintaining the lab curriculum. Another solution would be to have **more graduate teaching assistants to cover lab sections.**

The full-time equivalents (FTEs) and student credit hours (SCHs) generated by our program faculty are listed in Appendices D.6 and D.7, respectively. According to this data, the programs have generated an increasing number of FTEs from 18 to 22 over the past three years. These values exceed the roughly 16 full-time faculty we employ. However, graduate teaching assistants that cover many lab sections are not included in this count. The number of SCH has also increased dramatically from 7109 to 8799.

2.4.3 Faculty Scholarship

The 9 hour/semester course load for tenured and tenure-track faculty is a reduced load compared to the 12 hour/semester load that was required about four years ago. This campus-wide reduction was established to improve opportunities for scholarship, and has been a tremendous help in that area. **Research faculty provide extensive opportunities for one-on-one research activities with both undergraduate and graduate students** (Appendices E.5 and E.7) that have resulted in student presentations at conferences. Additionally, research faculty have aggressively pursued external funding opportunities (Appendix D.3). **Since 2007, the department has raised $1,201,461 in grant funding**, and has applied for an additional $6,000,000 in funds that were denied. The scholarly activities of individual faculty members has been provided in their curriculum *vitae* (see Appendix D.4).

2.4.4 Pedagogical Development Opportunities

Despite the reduced teaching load for research faculty, special opportunities for an even more reduced load (such as during the early years of the tenure-track or before approaching a promotion, or even on a regularly scheduled basis) would allow for not only more scholarly activity but also time for pedagogical development. The campus provides many opportunities for professional development (teaching and scholarship), but **faculty in our programs tend not to engage in such activities because there is not enough time in our busy schedules**. For example, the use of online grading systems for laboratories would alleviate some of the teaching burden and we would like to pursue this avenue, but there is no opportunity to develop such methods without a course release. Even if some resources already exist for improving teaching effectiveness (e.g. videos for teaching review concepts for upper level courses), finding those resources takes more time than the typical professor has available.

2.4.5 Faculty Review

The departmental Collegial Review Document (DCRD, Appendix D.5) describes the performance standards for annual faculty evaluation, reappointment, tenure, promotion and post-tenure review. This document was dramatically revised two years ago and is moderately well-accepted by the faculty. However, some faculty feel that the requirement of at least **one peer-reviewed publication from scholarship done at WCU is too large of a requirement for tenure and promotion given our current teaching load and lack of resources** (e.g. start-up funds). Others feel this requirement is a reasonable compromise for what we were asked to put forth by the upper administration. Additionally, some faculty take issue with the apparent weight given to the "student assessments of instruction" (SAIs) in judging teaching effectiveness, particularly in review committees beyond the department. They fear **the use of this tool may drive down**

the rigor of the program since making a course easier will likely improve SAI scores which, in turn, receives a favorable response for faculty evaluation by peers.

A new review of the DCRD, mandated by the university, is currently underway to address issues of teaching effectiveness and collegiality as well as the addition of language to explain a new 2- and 4-year review process (as opposed to the former annual process) for tenure-track professors recently adopted by the university. Our programs also plan to address the required documentation for the annual evaluation so that it is more similar to the documentation required for reappointment and tenure. In this way there will be less of a burden for faculty members that must prepare two documents in the same year (annual faculty evaluation and the reappointment package). We also plan to include some SAI "norms" from our department in the DCRD and explore the use of other means of evaluation (such as student performance in follow-up courses).

2.4.6 New Teacher Orientation

Orientation of new faculty members to the program has improved dramatically over the last few years. Two years ago, a mentoring program was piloted where new faculty were paired with experienced faculty based on their areas of expertise and course load. The mentor was a "goto" person for questions about effective teaching, developing a research program (if applicable), service requirements and opportunities, and other responsibilities. The program was largely a success, although it could be more formalized than it was. Since we have had no new faculty since the pilot, we have not yet had the opportunity to further develop its implementation.

Despite the success of a mentoring program for new faculty, **there is no formal program for new graduate teaching assistants (TAs)**. However, new students are encouraged to sit in on other students' lab sections, and weekly TA meetings are held so that TAs are prepared for the prelab lecture. At the beginning of each academic year, students are also required to attend a safety lecture that thoroughly explains required practices in both the teaching and research laboratory environments. This year, for the first time, TAs had direct access to SAIs and were therefore able to get feedback from their students regarding their teaching effectiveness. They are now able to use this feedback to further develop their teaching skills.

2.5 Standard 5: The program attracts, retains, and graduates high quality students.

2.5.1 Enrollment and Student Profile

The number of undergraduate students majoring in chemistry (Appendix C.5) has been decreasing slightly for the past five years. The decline is attributed to the creation of the Forensic Science program which lures some students from majoring in chemistry. Despite the small decline, **we currently have 51 junior and senior chemistry majors, the highest number of majors we've had in four years**. The total number of applicants and enrolled students stays fairly constant. (Appendix E.1). This year we admitted 34 students, 56% of whom were female. Although the number of minority and international students was unavailable at the time this report was prepared, we feel that the demographics of enrolled students majoring in chemistry reflect that of the university student population as a whole.

Enrollment in our MS program is lower than many other MS programs at WCU, but our **typical enrollment is comparable to the enrollment at most of our Carnegie peers** (see Appendix E.1). We currently have 11 graduate students (Appendix C.5) which is slightly lower than the 7-year average of 15. We have had a slight decrease in our graduate student enrollment over the past three years, which is a reflection of an increase in our programs admission standards (see below). **One of our goals is to increase the size of our graduate program to an optimal size of approximately 15 students while maintaining the current high academic standard.**

The number of minority and international students was unavailable at the time this report was prepared. However, we know that the MS program has a smaller proportion of international students compared to other chemistry graduate programs. This is mainly due to our relatively small assistantship and lack of tuition remission which creates financial hardship for international students enrolled in our program. Despite offering an small number of out-of-state tuition waivers, students receiving these are still responsible for in-state tuition, which many international students cannot afford. Consequently, the majority of our graduate students are white NC residents. Approximately 40% of our incoming MS students are female.

2.5.2 Program Viability

The viability of our undergraduate program is strong. The number of chemistry majors has remained fairly constant and demand for 100- and 200- level courses that serve both chemistry majors and other programs continues to grow dramatically. We have seen an increase in the number of Forensic Science students choosing chemistry as a second major or minor due to overlapping degree requirements. In fact, **the total number of chemistry minors has grown from 39 to 67 in the last four years** (see Appendix E.6).

Our MS program is also quite strong, despite the recent dip in enrollment described above. We plan to increase the enrollment slightly over time by exploring new recruitment techniques (described below). However, attracting qualified applicants remains problematic due to the lack of a tuition remission/waiver, which is offered by most of our Carnegie peer programs (see Appendix

E.3). Since the demand for 100-level courses has increased, and the labs for those courses are taught mainly by graduate teaching assistants, our ability to meet the instructional demands of both our programs and the university is declining. Not only do we need to increase the enrollment in our MS program to meet these new demands, but assistantships must be provided.

2.5.3 Qualifications of Students

Entry requirements for admission to programs in chemistry are described in Appendix E.4 and reflect the typical requirements for both undergraduate and graduate students at the university. **Freshman and transfer students that declare chemistry as their major have higher SAT scores, high school GPAs and high school ranks then the general student population** (Appendix E.2). Chemistry majors score 42-77 points higher on the SAT and graduate at the 73rd percentile of their graduating high school class as compared to the 65th percentile for all WCU students.

The average undergraduate GPA of applicants accepted and admitted to our MS program is 3.32. This is comparable to students admitted to the biology (3.33) and applied math (3.33) masters programs (Appendix E.2). The minimum GPA requirements for our Carnegie peers varies from 2.5-3.0. The minimum GPA requirement set by our graduate school is 2.8, but to receive a graduate assistantship, an applicant must have a GPA of 3.0. The program is working to improve the admission standards of accepted students. Despite the fact that this may decrease enrollment in the program, the higher quality of the students will result in a higher success rate.

GRE scores for students admitted to our MS program are slightly lower than those in the biology and applied math MS programs (Appendix E.2). The average combined GRE score for students admitted to our program is 1073. The minimum GRE requirements for admission to the MS programs of our Carnegie peers is not available. However, through correspondence with the graduate coordinators of these programs, we have found that most MS chemistry programs have an unofficial GRE minimum of 1000. Nonetheless, these programs frequently weigh other factors more heavily during the admission process such as strong letters of recommendation and prior research experience. Their rationale is that high GRE scores often are not a good indicator of student success.

2.5.4 Recruitment and Retention

Recruitment for the undergraduate program is done primarily through the multiple WCU open houses offered each year. Participants interested in chemistry receive a faculty-guided tour of our departments facilities and literature detailing degree requirements. Our website also serves as a source of information for prospective students. An undergraduate coordinator is listed as a point of contact for students that have questions about our program.

Recruitment of high caliber applicants for our MS program continues to be difficult. Highly-qualified candidates with a BS degree typically apply directly to PhD programs, since **in our discipline, a Master's degree is not a prerequisite for doctoral programs**. Our pool of applicants consists of students who cannot secure admission to a PhD program, students who do not wish to pursue a PhD and internal applicants that wish to continue their education at WCU. Past recruitment efforts have included participation in WCUs graduate school fair, delivering recruitment/research presentations at NC sister institutions, improving our website and directly contacting the chemistry faculty and students at our NC sister institutions. Most of our external applicants learn about our program via online searching for MS programs while our internal applicants are recruited by their research advisors. We have had an increase in the number of 4+1 MS students (see Appendix E.6). However, many of these students choose to attend PhD programs in lieu of completing the 4+1 MS degree at WCU. Directly contacting the chemistry faculty at other institutions has been somewhat successful in increasing the number of applicants, but delivering recruitment/research seminars at BS-only schools has not attracted many applicants. **Our department is currently discussing new methods for improving our marketing and recruitment efforts for our MS program.** These include creating a program focus or establishing some form of partnership with universities that have provided our program with qualified students in the past.

Another way to recruit higher-quality MS students is to obtain greater financial support for them in terms of assistantships and tuition remission/waivers. The value of the teaching assistantship for our program was increased from $7000/year to $10,500/year ($5250/semester) in 2006. This increase was prompted by our most recent program review, and the assistantship is now comparable to our Carnegie peers (average assistantship = $9,082/year, Appendix E.3). Despite this increase we still have some difficulty recruiting qualified candidates to our program. Many of our Carnegie peers and institutions with similar-sized programs offer full or partial tuition assistance for their students (Appendix E.3). **We do not currently offer any form of tuition assistance or remission for our in-state applicants.** We do receive a limited number (typically 2) of out-of-state tuition waivers. These waivers allow students to qualify for in-state tuition rates. However, tuition and fees for a full-time, in-state graduate student is $3251.50/semester, which does not include room and board. **Students attending our MS program often must rely on student loans or other sources (family) for support.** We believe that offering a larger financial package in the form of partial/full tuition assistance would greatly increase our ability to recruit high caliber students and grow our program.

2.5.5 Advising

All undergraduate chemistry majors are required to meet with a faculty academic advisor each semester. In these advising meetings, students plan their course schedule and evaluate the completeness of degree requirements according to the requirements listed in the course catalog (Appendix C.1), checksheets (Appendix C.2), and the program four-year plan (Appendix C.7). This policy has always been in place but is now being enforced to a greater degree in the past. As a result **we have shown an improvement in the consistency of academic advising.** Advising records for each student are kept locked in the departmental office (see Appendix E.9).

On average, about 50% of our incoming students choose a pre-professional concentration as part of their chemistry major. (See Appendix E.6.) While our department strives to work closely with the pre-professional advisor in the Honors College to provide guidance to our students interested in pre-professional programs, **the rate of acceptance of WCU graduates to medical, dental and veterinary schools needs improvement.** A consensus of faculty in the department feel that we need work on improving the success rate of our pre-professional graduates, and our department is currently working on strategies for improving in this area. One suggestion is to have a single faculty member serve as the academic advisor to all pre-professional chemistry majors. We also do not work closely with Career Services at WCU. Generally we act as a referral service for students interested in alternative careers, but prefer to do most of the chemistry-related career advising ourselves including a chemistry-related career information session offered during advising day. Nonetheless, **we plan to improve communication and collaboration between our department and career services in the future** in the hopes that students will receive the most complete information.

Despite the lack of formal interaction with Career Services, our students, both BS and MS, have a high success rate for placement in chemistry-related jobs and academic positions (see Appendix E.10). While it is difficult to track each student, **at least 69% of BS students and 85% of MS students have ended up in a chemistry-related field over the past three years.**

All MS candidates are required to meet with their thesis and research advisory committee (TRAC) every semester. The TRAC consists of the candidate's research advisor and two additional chemistry faculty. During these meetings the TRAC discusses the MS candidates research and progress toward his/her degree. MS candidates also interact with their research advisors on a daily basis. All MS candidates are also required to be enrolled in seminar each semester. MS candidates are informed of graduate school procedures, thesis and course requirements and important deadlines in seminar. The progress of graduate students is also monitored regularly by the departments graduate coordinator.

2.5.6 Enrichment Activities

Our program provides many opportunities for student enrichment such as faculty-guided independent research. **Approximately 40% of our majors are involved research for two or more semesters** (Appendix E.5 and E.7). Many of our students also take part in summer research at WCU or in REU programs at other institutions.

We also have a very active student organization the: Student Members of the American Chemical Society (SMACS). Each year these students engage in service activities and raise funds for social events and to attend the Pittsburg Conference, an annual chemistry conference. Attendance at this national meeting provides students with the opportunity to attend chemistry seminars and take part in graduate school and job fairs.

2.6 Standard 6: The program has an administrative structure that facilitates achievement of program goals and objectives.

2.6.1 Leadership

Our department as a whole is quite large due to the large number of service courses we provide and the number of programs housed within it (BS in chemistry, MS in chemistry, physics minor, environmental science program, and forensic science program). Dr. Cynthia Atterholt has served as the department head for $7\frac{1}{2}$ years and each interdisciplinary program and the graduate program has its own program coordinator who receives a course release for managing the program. In 2010, Dr. William Kwochka took on the role of associate department head, a new position in the department. **The administrative load is well-distributed among these leaders and helps to make our department more efficient.** Nonetheless, our department has administrative needs beyond the typical department at WCU (extensive purchasing, services extended to large numbers of students in different programs, etc.). For these reasons, **our department needs and plans to request an additional half-time position for an administrative support associate** for the next fiscal year.

The department head serves as the liaison between our department and the college. She stays well-informed by attending regularly-scheduled department head meetings at the college-level and semi-annual half-day workshops with the provost. These meetings are quite useful since they are very comprehensive and cover a wide-range of important topics. There is also a lot of support for department heads from the dean, associate provost, and provost which includes the opportunity to travel to Chapel Hill for a full-day training workshop. With the exception of the Leadership Conference, hosted annually by the Coulter Faculty Commons and open to any who wish to attend, **there is a lack of specific training and support for program coordinators and associate**

department heads.

2.6.2 Decision-Making Processes

Issues requiring decisions are consistently brought forth by the department head and other faculty at faculty meetings where faculty are given ample opportunity for input. **The department head balances faculty opinion and political trends within the administration.** While faculty are also very involved in departmental committees (e.g. curriculum committee), **increased involvement in program assessment is still necessary.** The newly formed assessment committee is addressing these issues. The involvement of other constituencies, such as students and alumni, in decision-making processes is quite limited. About one year ago, we first implemented an exit interview for graduating seniors (Appendix E.11). Additionally, a small group analysis of our Master's program was just completed by the Coulter Faculty Commons this semester (Appendix E.12). Feedback from these interviews and the analysis guides decisions about programatic changes and curriculum development. An alumni network, other than the four former students currently employed by our department, has not really been established, but the formation of an alumni advisory committee has been discussed. This group could serve as a mechanism for external input into program decisions.

2.6.3 Faculty Involvement in Review Processes

The level of faculty participation in peer review events (annual faculty evaluation, reappointment, tenure and promotion) is dictated by the departmental Collegial Review Document (DCRD, Appendix D.5). The DCRD describes the composition of the evaluation committees. However, the addition of more untenured faculty, including lecturers and instructors, in the review process could be beneficial, and will be discussed as the DCRD is revised this semester. The degree of feedback given to review candidates is guided by the Faculty Handbook. However, these criteria are perceived as somewhat vague, and **faculty feel that additional feedback and more consistent feedback procedures are needed**. Evaluation of the associate department head and program coordinators is treated the same as ordinary faculty members. However, evaluation of the department head is handled by the dean. Her annual evaluation is based on results from anonymous faculty surveys, a personal evaluation report, and input from the associate deans and deans office staff.

2.7 Standard 7: The program has adequate resources to meet its goals and objectives.

While the department has weathered the recent series of budget cuts due to the economic downturn in the United States, increased student enrollment at the university, particularly in the sciences, has strained the department's ability to provide a quality education to its students. In the following section, we will address the adequacy of departmental resources in terms of the departmental budget; facilities and laboratories, instructional technology, and library resources; program staffing needs; and effective and appropriate use of staff.

2.7.1 Departmental Budget

Overall, the operating budget allocated to support the mission and goals of the department (itemized in Appendix G.1) is adequate. While the department is able to purchase office supplies, has an adequate copy budget, can purchase most of the needed lab supplies for the teaching labs, and meet the occasional research supply needs of faculty, **the current budget model does not provide sufficient funds for improvement or growth of the department.** The most immediate funding needs, other than personnel (which is addressed below) are for the maintenance and operation of our aging instrumentation and the support of faculty in their scholarly pursuits. The discipline of chemistry is heavily reliant of the use of technology, and in order to provide our students with the best educational experience possible, it is incumbent on the department to keep up-to-date with this instrumentation. Thus, the recent loss of around $65,000 in service contracts has greatly impacted the department. Likewise, the university has done an inadequate job in supporting beginning faculty with start-up funding for the last 15 years. On average, new faculty received start-up packages of $16,000 distributed over 2 years to initiate their research programs.

2.7.2 Facilities, Instructional Technology and Library Resources

The currency and adequacy of facilities and laboratories, instructional technology, and library resources to support the mission and goals of the program is becoming an increasingly important issue. The Natural Sciences Building is home to the departments of Biology and Chemistry & Physics. Most of the faculty in these departments have research space located in this building and are proud to offer their students innovative and demanding research experiences (see Appendix E.7), several of which are externally funded (see Appendix D.3). However, **the extent to which we can offer these experiences and our research productivity are severely hampered by the physical limitations of the facility.** The Natural Sciences Building was built in 1972 and only a few rooms have been updated since then. Much of the work in those updates was actually done by faculty using scavenged parts and surplus lab and office furniture. At the very least, the Natural Sciences Building needs extensive renovation in order to even begin approaching modern standards of safety and efficiency (both energy and space), not to mention improving the overall appeal of the facility. Perhaps the best course of action, however, would be to begin again with the construction of a new science facility. Space for students to gather and work both in and outside of the laboratory setting is practically non-existent. Meeting space in the department is also extremely limited and ill-equipped.

Likewise, the computers, instrumentation, and equipment housed within the Natural Sciences Building needs to be updated. The drastic reduction in service contracts for the department's aging instrumentation is cause for concern; students and faculty alike rely on this instrumentation for education and training. (See Appendix G.2 for a list of facilities and equipment.) **Several of the older pieces of instrumentation need to be rotated out of the labs and replaced with more current systems.** Data related to the computers used in the department is summarized in Appendix G.3. Many of the computers running the instrumentation in laboratories are quite old (pre-2006), and several have no USB ports or run on the Windows 95 operating system. Related to the hardware issues in the department, **much of the software used on these instrument computers needs to be upgraded, but that cannot be accomplished without first upgrading the computers themselves.**

While many of the teaching rooms (labs and lecture) are equipped with adequate teaching technologies, these rooms have such odd configurations that use of existing resources is very inefficient. Wireless connectivity across campus and particularly in the Natural Sciences Building is inadequate, making it **difficult for students to use their laptops for coursework and acquisition of data in both the teaching and research laboratories.** The library and library staff has been very supportive of both the department's teaching and research efforts. Access to several important databases and search tools is quite good (Appendix G.4), and the department appreciates the efforts of the library's science liaison.

2.7.3 Staffing Needs

Enrollment in chemistry courses is on the rise (particularly in 100- and 200-level courses, see Appendix C.4). This is due in part to overall enrollment increases within the university, much of which has occurred in the College of Arts and Sciences. Although the number of majors in chemistry have decreased over the past five years (Appendix C.5), the number of students requiring chemistry courses has increased sharply due mainly to the creation of the Forensic Science program. Due to the rapid increase in enrollment, **the department is finding it increasingly difficult to staff courses.** This is especially challenging due to the capacity of laboratory courses. (If we increased enrollment in lectures to accommodate more students, staffing of lab sections is still difficult because laboratories at the 100-level can only hold a maximum of 24 students, while 200- and 300-level courses hold even fewer.) One hundred-level lab sections are typically taught by graduate students, but our graduate student enrollment (Appendix E.1) is not sufficient to cover all the required courses. To date, the department has made use of both full-time and part-time faculty to staff some lab sections which, in turn, makes it more challenging to offer upper-level courses regularly. While we have managed to cover all our courses to date,**we have had to reduce the offering of some LS courses to cover the load, and we may not be able to cover other required courses if enrollment continues to increase without additional resources.** The addition of two types of teachers, teaching faculty and graduate teaching assistants (TAs), would alleviate some of the enrollment pressure which would tremendously benefit the department and, therefore, our students.

The teaching load of non-tenure-track instructors has been presented in Section 2.4. The four instructors in chemistry make invaluable contributions to both our introductory and upper-level courses in the department. **Salaries of these instructors, particularly the lecturers, who make only $27,000/year, need to be examined and increased to reflect their workload.** Another valuable teaching resource would be the implementation of tenure-track lines for teaching-only faculty. To our knowledge, this classification does not exist on campus, but would be a tremendous resource for the education of our students.

Likewise, chemistry TAs provide a valuable service to the university by teaching the bulk of introductory chemistry laboratories, and, in turn, these TAs gain valuable teaching experience. Under the university's current model, TAs are funded by the Graduate School. In the past few years, there has been a decline in the number of assistantships available from the Graduate School. (This is in part because of budget constraints, but also we have been offered fewer assistantships since we have decreased enrollment by raising admission standards. See Appendix E.3 for data.) Stipends for our TAs (currently at $10,500/academic year) have not changed in five years. While these are comparable with our Carnegie peer institutions (see Appendix E.3), perhaps a more important issue with regard to our TAs, however, is the lack of available tuition assistance. **Currently, the department is allocated only two out-of-state waivers from the Graduate School, so graduate students barely break even after paying their tuition ($3251.50/semester).** While this may be the norm in other disciplines, it is very uncommon in chemistry, and the lack of tuition waivers combined with the low stipend makes it difficult for us to recruit and retain high quality students.

Support positions in the department are listed in Appendix G.5. The College of Arts and Sciences has a research operations manager, with an office in the our department, that manages the stockroom and student workers, handles waste disposal, is responsible for inventory, autoclave management, purchases, gas supply, etc. not only for our department, but also programs in biology, forensic science, environmental science and geosciences and natural resources management. **The**

responsibilities for our programs alone warrant a dedicated position.

Appendices

A Documentation for Standard 1

A.1 Mission and Strategic Vision of WCU and the College of Arts and Sciences

WCU Mission Statement

The WCU mission statement was taken from `http://www.wcu.edu/12953.asp`:
Western Carolina University creates engaged learning opportunities that incorporate teaching, research and service through residential, distance education and international experiences. The university focuses its academic programs, educational outreach, research and creative activities, and cultural activities to improve individual lives and enhance economic and community development in the region, state and nation.

WCU Vision Statement

The WCU vision statement (pending approval) was taken from `http://www.wcu.edu/24364.asp`:
Western Carolina University will be a national model for student learning and engagement that embraces its responsibilities as a regionally engaged University.

WCU Strategic Plan

The complete strategic plan (pending approval) for WCU can be found at `www.wcu.edu/WebFiles/PDFs/oipe_Strategic_Plan_2008-??2013_Proposed20090115.pdf`.

College of Arts and Sciences Mission Statement

The College of Arts and Sciences mission statement was taken from `http://www.wcu.edu/1961.asp`:
The College of Arts and Sciences operates under the Office of Academic Affairs at Western Carolina University. Its constituent members include the departments of Anthropology and Sociology; Biology; Chemistry and Physics; Communication; English; Geosciences and Natural Resources; History; Mathematics and Computer Science; Modern Foreign Languages; and Political Science and Public Affairs. The college also houses the Associated Area of Philosophy and Religion, and the following programs: Arts and Sciences Interdisciplinary, and Social Sciences.

The role of the College of Arts and Sciences is to implement the universitys mission through exploration of a broad range of human experience, knowledge, and expression.

The most significant activity is the learning/teaching process that takes place in classrooms, laboratories, studios, field locations, and offices, which engages students, staff, and faculty in a common effort to provide an environment where intellectual challenge, the free exchange of ideas, and high standards of scholarship and creativity prevail.

The college fulfills the university's declared aspirations through its curricula in the following ways:

- Programs in the fine arts, humanities, and sciences
- General Education courses that provide the basic skills and perspectives essential for preparing all university students for effective participation in contemporary life
- Support for the Honors College and Honors course options
- Specialized courses that serve the baccalaureate and graduate degree programs of the college and its sister colleges
- Courses and programs that support teacher preparation
- Appropriate and responsible integration of technology as a tool for learning
- Faculty advisement of students

The college supports the universitys declared aspirations through discipline-related activities that benefit the university, region, state, nation, and the international community, in the following ways:

- Research, creative activity, and scholarly pursuits
- Faculty and student activities that reach beyond the classroom to a wider audience
- Faculty and student participation in university governance through involvement in departmental, college, and university activities.

A.2 Mission/purpose of the program

Mission Statement for Chemistry Programs

The primary purpose of the BS and the MS programs in chemistry is to prepare students for future careers in chemical-related industries or science-related graduate programs. The programs also strive to teach students to think critically and solve problems through educational experiences both in and outside of the classroom. Lastly, we provide educational support to other disciplines by offering introductory courses suited to their needs. In particular, our courses are taken by students in health-related fields, engineering, and other science programs.

B Documentation for Standard 2

B.1 Description of programs' ongoing planning processes

Since the time of our last review, the department has kept up with the completion of annual assessment reports that have addressed the five learning outcomes from the most recent assessment plan. While this procedure has met the requirements of the Office of Institutional Planning and Effectiveness, it has done little to serve the growth of the department since reports are handled by just a few faculty members.

In an effort to make our assessment process more effective, the department has formed an assessment committee. This committee has worked together to prepare this self-study, and will work to review the feedback from external reviewers in order to develop mechanisms for improvement in all areas of both the BS and MS programs.

The assessment committee (consisting of about six members of chemistry faculty of every rank) will meet several times per semester to institute mechanisms for assessment and to implement the assessment plan. Members will either contribute directly with data collection or request data of other committees already in place (e.g. the curriculum committee). The assessment committee will objectively analyze collected data and use this data to prepare annual assessment reports. We anticipate the formation of this committee will serve to improve communication and coordination among the faculty and provide enhancement to the quality of the BS and MS programs over time.

B.2 Programs' strategic plans

BS Program – Strategic Goals

- Train students to become critical thinkers
  Upon graduation, students will likely find jobs in the chemical industry or pursue graduate education in chemistry, professional programs, or related fields. All of these destinations will require critical think skills to analyze new problems. Our goal is to give our students those skills through both in-class instruction and out-of-class research experiences. Students will be asked to solve new problems based on previous learned information.

- Train students to become effective communicators
  Any post-graduation path will require the use of effective written and oral communication. Students are given many opportunities to practice in both these areas through the assignment of written lab reports as well as oral presentations of class and research projects. While the assignment itself serves to give students practice in these skills, feedback from instructors and the opportunity for revision will play an even more important role in the perfection of these skills.

- Prepare students for employment in the current economy
  By providing students with a well-rounded education within the discipline of chemistry, students are prepared for employment in any chemical industry or any further education. Providing hands-on experience with research and instrumentation will also increase their employability and their chances for success in graduate studies.

- Increase opportunities for pursuing biochemical studies
  The department currently employs one biochemist, and students are required to take one semester of biochemistry from either the biology or the chemistry and physics department. To improve opportunities for learning in this subdivision of chemistry, we would need to have more required course offerings in the field of biochemistry and perhaps employ more than one biochemist within the department.

- Improve advising for preprofessional students (premed, pre-dentistry, etc.)
  A significant percentage (42-58% over the last four years, see Appendix E.6) of entering students choose a preprofessional track within the chemistry degree. However, there are no faculty in our department that have experience with preprofessional programs. We must continue to develop relationships outside of our discipline to help advise these students on the requirements of graduate-level professional programs as well as help them to find experiences that will shape their decisions to pursue professional degrees.

- Provide improved resources for job and graduate school placement
  Currently, our program provides a 1 hour group advising session each year to inform students about career opportunities in chemistry. Beyond this group session, the department does not have a well-defined mechanism for helping students access resources regarding job and graduate school placement beyond posting fliers on bulletin boards. A more defined resource that includes liaising with Career Services should be developed.

- Improve information stream for chemistry-related extra-curricular activities (REU, internships, etc.)
  Extra-curricular chemistry-related activities abound both within the department, nationally, and abroad. Most information regarding these activities is passed to students via word-of-mouth. A more defined mechanism should be developed.

MS Program – Strategic Goals

- Train students to become critical thinkers
  Upon graduation, students will likely find jobs in the chemical industry or pursue graduate education in chemistry, professional programs, or related fields. All of these destinations will require critical think skills to analyze new problems. Our goal is to give our students those skills through both in-class instruction and out-of-class research experiences. Students will be asked to solve new problems based on previous learned information.

- Train students to become effective communicators
  Any post-graduation path will require the use of effective written and oral communication. Students are given many opportunities to practice in both these areas through the assignment of written lab reports as well as oral presentations of class and research projects. While the assignment itself serves to give students practice in these skills, feedback from instructors and the opportunity for revision will play an even more important role in the perfection of these skills.

- Prepare students for employment in the current economy
  By providing students with a well-rounded education within the discipline of chemistry, stu-

dents are prepared for employment in any chemical industry or any further education. Providing hands-on experience with research and instrumentation will also increase their employability and their chances for success in graduate studies.

- Increase opportunities for pursuing biochemical studies
  The department currently employs one biochemist, and students are required to take one semester of biochemistry from either the biology or the chemistry and physics department. To improve opportunities for learning in this subdivision of chemistry, we would need to have more required course offerings in the field of biochemistry and perhaps employ more than one biochemist within the department.

- Improve the rigor of the program by including non-crosslisted 500-level and more 600-level courses
  Currently, all of our graduate-level courses (with the exception of seminar and research) are crosslisted with undergraduate courses at the 400/500-level. Additional graduate-level coursework that is not crosslisted will enhance the rigor of the program while simultaneously improving the quality of our graduating students. However, issues associated with low-enrollment have prevented these course offerings in the past. To accomplish this goal, total enrollment for the program may need to increase (see below), and the addition of tenure/tenure-track faculty may be required.

- Increase enrollment slightly
  For reasons described above, increasing the total enrollment for the program would be beneficial. Additionally, increasing the enrollment would likely increase research productivity of the faculty.

- Increase the number of applicants to the 4+1 program
  The 4+1 program is a direct feed to the MS program, and some of our highest quality graduate students come from this concentration. An increase in the number of applicants could come directly from advising of undergraduate students.

- Improve recruitment and retention of highly-qualified students
  Improved recruitment techniques would increase the number of applicants to the program. In order for those applicants to be high quality and to be retained, student incentives must be improved. This could potentially include increasing the value of stipends, tuition waivers/remission, and special awards for outstanding students.

- Consider forming a central focus for the program
  In the past, the program has considered forming a central focus for the program, such as an environmental focus or a materials focus. It is possible that this form of branding would improve visibility and the uniqueness of the program which may increase the number of applicants.

- Explore potential for interfacing with other in-state programs
  Another mechanism for increasing enrollment is to provide the option for dual or shared degrees with other state institutions with or without a graduate program. Collaborations would improve the network of the faculty as well as provide additional resources for students such as graduate-level online courses or unique research opportunities.

C Documentation for Standard 3

C.1 Catalog copy of program curricula

Chemistry (General Concentration), B.S.

Print this Page

Total number of hours for the program: 120.

This concentration is intended for those students wishing to pursue a career in a specific chemistry-related discipline other than biochemistry. Students should choose the chemistry courses in the concentration that best represent the chemistry sub-discipline of choice. The student should also consider completing general elective in their intended area of specialization. For example, students wishing to pursue a career in environmental chemistry should consider additional course work in areas such as biology, geology, natural resource management, or environmental health.

Liberal Studies Hours: 42

Liberal Studies Program Requirements

Major Requirements

The major requires 45 hours in Chemistry as follows:

- CHEM 139 - General Chemistry I Credits: (4)
- CHEM 140 - Advanced General Chemistry Credits: (4)
- CHEM 232 - Quantitative Analysis Credits: (4)
- CHEM 241 - Organic Chemistry I Credits: (3)
- CHEM 242 - Organic Chemistry II Credits: (3)
- CHEM 272 - Organic Chemistry Lab Credits: (2)
- CHEM 352 - Physical Chemistry I Credits: (3)
- CHEM 361 - Principles of Biochemistry Credits: (3)
- CHEM 370 - Instrumental Analysis I Credits: (4)
- CHEM 371 - Chemical Dynamics Credits: (2)
- CHEM 495 - Seminar in Chemistry Credits: (I, R4)
- MATH 153 - Calculus I Credits: (4)
- PHYS 230 - General Physics I Credits: (4)
- PHYS 231 - General Physics II Credits: (3-4)
  (4 required)

General Concentration

Concentration Requirements

The concentration requires 15 hours as follows:

- MATH 255 - Calculus II Credits: (4)
- CHEM 321 - Inorganic Chemistry Credits: (3)
- CHEM 472 - Chemical Syntheses Credits: (2)

Choose 6 hours from the following:

- CHEM 411 - Industrial Chemistry Credits: (3)
- CHEM 421 - Advanced Inorganic Chemistry Credits: (3)
- CHEM 435 - Instrumental Analysis II Credits: (3)
- CHEM 441 - Advanced Organic Chemistry Credits: (3)
- CHEM 453 - Physical Chemistry II Credits: (3)
- CHEM 454 - Computer Interfacing Credits: (3)
- CHEM 461 - Environmental Chemistry Credits: (3)
- CHEM 465 - Forensic Chemistry Credits: (4)
- CHEM 493 - Topics in Chemistry Credits: (1-3, R6)

General Electives

General electives (18-27 hours) are required to complete the program depending on the number of hours taken in the major that double count for Liberal Studies. Students must take at least 30 hours at the junior-senior level at WCU in order to satisfy general university degree requirements.

Visit the department's website at http://www.wcu.edu/4409.asp to view the 8 semester curriculum guide.

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Chemistry (Premedical/Biomedical Science and Technology Concentration), B.S.

Print this Page

Total number of hours for the program: 120.

This concentration is intended for those students wishing to pursue a career in the biomedical or biotechnology fields, including students wishing to pursue a degree from a medical, dental, pharmacy, veterinary, or optometry school. Specific courses within the concentration should be chosen carefully, based on the intended career path. Students anticipating obtaining a professional degree (such as an M.D. or Pharm.D.) should also judiciously choose their electives to satisfy admissions preferences and fully prepare for entrance exams.

Liberal Studies Hours: 42

Liberal Studies Program Requirements

Major Requirements

The major requires 45 hours in Chemistry as follows:

- CHEM 139 - General Chemistry I Credits: (4)
- CHEM 140 - Advanced General Chemistry Credits: (4)
- CHEM 232 - Quantitative Analysis Credits: (4)
- CHEM 241 - Organic Chemistry I Credits: (3)
- CHEM 242 - Organic Chemistry II Credits: (3)
- CHEM 272 - Organic Chemistry Lab Credits: (2)
- CHEM 352 - Physical Chemistry I Credits: (3)
- CHEM 361 - Principles of Biochemistry Credits: (3)
- CHEM 370 - Instrumental Analysis I Credits: (4)
- CHEM 371 - Chemical Dynamics Credits: (2)
- CHEM 495 - Seminar in Chemistry Credits: (I, R4)
- MATH 153 - Calculus I Credits: (4)
- PHYS 130 - Introductory Physics I Credits: (4)
  and
- PHYS 131 - Introductory Physics II Credits: (4)
  or
- PHYS 230 - General Physics I Credits: (4)
  and
- PHYS 231 - General Physics II Credits: (3-4)

Premedical/Biomedical Science and Technology Concentration

Concentration Requirements

The concentration requires 22 hours as follows:

- BIOL 140 - Principles of Biology I Credits: (4)
- BIOL 141 - Principles of Biology II Credits: (4)
- BIOL 240 - Introduction to Genetics Credits: (4)
- BIOL 333 - Cell and Molecular Biology Credits: (4)
- CHEM 321 - Inorganic Chemistry Credits: (3)

and 3 hours selected from the following:

- BIOL 311 - Animal Physiology Credits: (3)
- BIOL 412 - Cellular and Molecular Immunology Credits: (3)
- BIOL 413 - Principles of General Microbiology Credits: (3)
- BIOL 419 - Cell Biology Credits: (3)
- BIOL 424 - Pharmacology Credits: (3)
- CHEM 435 - Instrumental Analysis II Credits: (3)
- CHEM 453 - Physical Chemistry II Credits: (3)
- CHEM 462 - Molecular Bioinformatics Credits: (3)
- CHEM 463 - Molecular Biotechnology Credits: (3)
- CHEM 464 - Genomics Credits: (3)

General Electives

General electives (12-20 hours) are required to complete the program depending on the number of hours in the major that double count for Liberal Studies. Students must take at least 30 hours at the junior-senior level at WCU in order to satisfy general university degree requirements. Pre-medical, pre-dental, pre-pharmacy, pre-veterinary, and pre-optometry students should discuss with their advisers the most appropriate electives for their intended professional school. Some examples of electives that may aid in professional school entrance exams and/or satisfy admissions preferences are included below:

- BIOL 291 - Human Anatomy and Physiology I Credits: (4)
- BIOL 292 - Human Anatomy and Physiology II Credits: (4)
- CS 150 - Problem Solving and Programming I Credits: (4)
- MATH 255 - Calculus II Credits: (4)
- MATH 270 - Statistical Methods I Credits: (3)
- PAR 230 - Legal, Scientific, & Critical Reasoning Credits: (3)

Additional Information

Visit the department's website at http://www.wcu.edu/4409.asp to view the 8 semester curriculum guide.

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Chemistry (ACS-Certified Concentration with 4+1 Option), B.S.

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Total number of hours for the program: 120.

Students completing this concentration are certified by the Committee on Professional Training of the American Chemical Society. This concentration is intended for those students who are anticipating pursuing a graduate degree in chemistry or a related field. The 4+1 option, described in detail below, allows students to earn both a B.S. and M.S. in Chemistry from WCU in 5 years. As this degree concentration requires independent research with faculty advisor, students anticipating pursuing a career as an R & D chemist will also be best prepared to enter the workforce.

Liberal Studies Hours: 42

Liberal Studies Program Requirements

Major Requirements

The Chemistry core curriculum requires 45 hours in Chemistry as follows:

- CHEM 139 - General Chemistry I Credits: (4)
- CHEM 140 - Advanced General Chemistry Credits: (4)
- CHEM 232 - Quantitative Analysis Credits: (4)
- CHEM 241 - Organic Chemistry I Credits: (3)
- CHEM 242 - Organic Chemistry II Credits: (3)
- CHEM 272 - Organic Chemistry Lab Credits: (2)
- CHEM 352 - Physical Chemistry I Credits: (3)
- CHEM 361 - Principles of Biochemistry Credits: (3)
- CHEM 370 - Instrumental Analysis I Credits: (4)
- CHEM 371 - Chemical Dynamics Credits: (2)
- CHEM 495 - Seminar in Chemistry Credits: (I, R4)
- MATH 153 - Calculus I Credits: (4)
- PHYS 230 - General Physics I Credits: (4)
- PHYS 231 - General Physics II Credits: (3-4)

ACS-Certified Chemistry Concentration

The concentration requires 23 hours as follows:

- MATH 255 - Calculus II Credits: (4)
- MATH 256 - Calculus III Credits: (4)
- CHEM 321 - Inorganic Chemistry Credits: (3)
- CHEM 380 - Research in Chemistry Credits: (1-3,R12) 4 credit hours of CHEM 380 are required.
- CHEM 435 - Instrumental Analysis II Credits: (3)
- CHEM 453 - Physical Chemistry II Credits: (3)
- CHEM 472 - Chemical Syntheses Credits: (2)

ACS-Certified Chemistry Concentration 4+1 Option

The concentration requires 23 hours as follows:

- MATH 255 - Calculus II Credits: (4)
- MATH 256 - Calculus III Credits: (4)
- CHEM 321 - Inorganic Chemistry Credits: (3)
- CHEM 380 - Research in Chemistry Credits: (1-3,R12) 4 credit hours of CHEM 380 are required, although 4+1 students are strongly encouraged to complete at least 6 hours of research to ensure timely completion of the M.S. degree.
- CHEM 535 - Instrumental Analysis II Credits: (3)
- CHEM 553 - Physical Chemistry II Credits: (3)
- CHEM 572 - Chemical Syntheses Credits: (2)

Electives

General electives (10-19 hours) are required to complete the program depending on the number of hours in the major that also count for Liberal Studies. Students must take at least 30 hours at the junior-senior level at WCU in order to satisfy general university degree requirements. Students may wish to consider the following electives to aid in their development as a professional chemist:

- PAR 320 - Philosophical and Religious Classics Credits: (3)
- MATH 270 - Statistical Methods I Credits: (3)
- ENGL 305 - Technical Writing Credits: (3)
- CS 150 - Problem Solving and Programming I Credits: (4)
- CS 151 - Problem Solving and Programming II Credits: (4)

4+1 Option

The Four Plus One option in Chemistry allows an outstanding student to complete the requirements for both B.S. and M.S. degrees in a period of 5 years. Students are expected to meet all of the requirements of the M.S. program. These include a minimum of 30 semester hours of graduate study, including a thesis and an oral defense of the thesis. Once a student has completed the B.S. he/she formally applies to the graduate school. Students begin research while earning the B.S. degree. Up to 12 credit hours of 500+ course work taken in the undergraduate program can count toward M.S. degree requirements. All grades, even those below a B taken at the 500+ level will count toward both the graduate and undergraduate GPA. All graduate degree program rules apply to all courses taken for the graduate program, including the 500 level courses taken as an undergraduate student.

Students applying for the 4+1 B.S. program in Chemistry must meet the following guidelines:

- a minimum cumulative GPA and GPA in the chemistry major of 3.00 at WCU.
- Completed a minimum of seventy-five (75) and a maximum of ninety-six (96) credit hours in their undergraduate programs, including graduate courses taken as an undergraduate.
- Completed at least two sections of CHEM 380-Research before completing the B.S. degree.

Applicants must be approved by the Graduate School, Department Head, Departmental Graduate Program Director and the Thesis advisor. After the student receives the B.S. degree, meets and completes admission requirements, he or she may be officially admitted into the M.S. degree program depending on GRE scores. After admission to the master's program, the 500+ courses in which the student completed (and made a grade of C or better) during the B.S. will be applied toward the requirements of the M.S. degree. These courses also count toward the 120 hours needed for the B.S. degree.

Students need to be aware that making 3 Cs or below automatically dismisses them from the Graduate degree program of study - the courses taken at the undergraduate level in anticipation of counting in the M.S. program also apply to this rule.

Additional Information

Visit the department's website at http://www.wcu.edu/4409.asp to view the 8 semester curriculum guide.

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Chemistry (M.S.)

Program Admission Requirements

In addition to the Graduate School Admission Requirements, applicants must have achieved an average grade of B or higher as defined by the major department in upper-level undergraduate courses in the major. A personal interview may be requested. The General Test of the Graduate Record Examinations (GRE) is required, as are three recommendations from former instructors who are in a position to judge the applicant's aptitude for graduate study.

Program Description

The program for the MS degree in chemistry requires a minimum of 30 semester hours of graduate study, including a thesis as specified by the Department of Chemistry and Physics. An oral defense of the thesis is required. At least one half of the coursework must be from those courses numbered 600 or above.

Required (30 hours)

12 hours in the following

3 hours of

- CHEM 696 - Seminar in Chemistry Credits: 1, R3

6 hours of

- CHEM 698 - Research in Chemistry Credits: 3, R15

3 hours of

- CHEM 699 - Thesis Credits: 3, R9

9 hours selected from 3 of the following courses

- CHEM 535 - Instrumental Analysis II Credits: 3
- CHEM 541 - Advanced Organic Chemistry Credits: 3
- CHEM 553 - Physical Chemistry II Credits: 3
- CHEM 621 - Graduate Inorganic Chemistry Credits: 3

9 hours in course work approved by the student's research advisory committee.

Environmental Chemistry Concentration

The program for the M.S. in Chemistry with an Environmental Chemistry concentration requires a minimum of 30 semester hours of graduate study, including an environmentally related thesis as specified by the Department of Chemistry and Physics.

Required Courses

- 6 hours of environmentally related courses; and
- 9 hours of electives approved by the student's thesis research advisory committee.

- CHEM 561 - Environmental Chemistry Credits: 3

3 hours of

- CHEM 696 - Seminar in Chemistry Credits: 1, R3

  6 hours of
- CHEM 698 - Research in Chemistry Credits: 3, R15

  3 hours of
- CHEM 699 - Thesis Credits: 3, R9

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Chemistry—Four Plus One (M.S.)

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The program for the M.S. degree in Chemistry requires a minimum of 30 semester hours of graduate study, including a thesis as specified by the Department of Chemistry and Physics. An oral defense of the thesis is required.

Required Courses

- 19 semester hours in at least 3 areas of chemistry approved by the student's thesis research advisory committee

  2 hours of
- CHEM 696 - Seminar in Chemistry Credits: 1, R3

  6 hours of
- CHEM 698 - Research in Chemistry Credits: 3, R15

  3 hours of
- CHEM 699 - Thesis Credits: 3, R9

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C.2 Advising checksheets

B.S. in Chemistry, General Concentration
Program Requirements (Effective Fall 2011)

Term	Grade	Course	Hours
Liberal Studies (C2 and C5 courses are met with major requirements)			**33**
		First Year Seminar, 190 or 191	3
		C1: ENGL 101 - Writing and Rhetoric	3
		C1: ENGL 202 - Writing and Critical Inquiry	3
		C3: CMHC 201 - Intro. to Speech Communication	3
		C4: Wellness	3
		*P1: Social Science, course 1	3
		*P1: Social Science, course 2 *(must be from a different discipline than course 1)*	3
		*P3: History	3
		*P4: Humanities	3
		*P5: Fine & Performing Arts	3
		*P6: World Cultures	3
		**Note: at least one of the LS perspectives must be at the junior-senior level*	

Chemistry Core			**45**
		CHEM 139 - General Chemistry I	4
		CHEM 140 - Advanced General Chemistry	4
		CHEM 232 - Quantitative Analysis	4
		CHEM 241 - Organic Chemistry I	3
		CHEM 242 - Organic Chemistry II	3
		CHEM 272 - Organic Chemistry Lab	2
		CHEM 352 - Physical Chemistry I	3
		CHEM 361 - Principles of Biochemistry	3
		CHEM 370 - Instrumental Analysis I	4
		CHEM 371 - Chemical Dynamics	2
		CHEM 495 - Seminar in Chemistry	1
		MATH 153 - Calculus I	4
		PHYS 230 - General Physics I	4
		PHYS 231 - General Physics II	4

General Concentration (6 hours from elective choices: CHEM 411 (3), CHEM 421 (3), CHEM 435 (3), CHEM 441 (3), CHEM 454 (3), CHEM 461 (3), CHEM 465 (4), CHEM 493 (1-3))			**15**
		CHEM 321 - Inorganic Chemistry	3
		CHEM 472 - Chemical Syntheses	2
		MATH 255 - Calculus II	4
		Elective I (see above)	3
		Elective II (see above)	3

General Electives (3 hours must be at the junior-senior level)			**27**

Graduation Check

- ☐ 30 hours of 300-400 level classes at WCU
- ☐ Upper level perspective
- ☐ GPA in major ≥ 2.0
- ☐ 120 total hour

Updated: 08/27/2011 (CLH)

B.S. in Chemistry, Premedical/Biomedical Science & Technology Concentration
Program Requirements (Effective Fall 2011)

Term	Grade	Course	Hours
Liberal Studies (C2 and C5 courses are met with major requirements)			**33**
		First Year Seminar, 190 or 191	3
		C1: ENGL 101 - Writing and Rhetoric	3
		C1: ENGL 202 - Writing and Critical Inquiry	3
		C3: CMHC 201 - Intro. to Speech Communication	3
		C4: Wellness	3
		*P1: Social Science, course 1	3
		*P1: Social Science, course 2 *(must be from a different discipline than course 1)*	3
		*P3: History	3
		*P4: Humanities	3
		*P5: Fine & Performing Arts	3
		*P6: World Cultures	3
		**Note: at least one of the LS perspectives must be at the junior-senior level*	

Chemistry Core			**45**
		CHEM 139 - General Chemistry I	4
		CHEM 140 - Advanced General Chemistry	4
		CHEM 232 - Quantitative Analysis	4
		CHEM 241 - Organic Chemistry I	3
		CHEM 242 - Organic Chemistry II	3
		CHEM 272 - Organic Chemistry Lab	2
		CHEM 352 - Physical Chemistry I	3
		CHEM 361 - Principles of Biochemistry	3
		CHEM 370 - Instrumental Analysis I	4
		CHEM 371 - Chemical Dynamics	2
		CHEM 495 - Seminar	1
		MATH 153 - Calculus I	4
		PHYS 130 or 230 - General Physics I	4
		PHYS 131 or 231 - General Physics II	4

Premedical/Biomedical Science & Technology Concentration (3 hours from elective choices: BIOL 311 (3), BIOL 412 (3), BIOL 413 (3), BIOL 414 (2), BIOL 419 (3), BIOL 424 (3), CHEM 435 (3), CHEM 453 (3), CHEM 462 (3), CHEM 463 (3), CHEM 464 (3))			**22**
		CHEM 321 - Inorganic Chemistry	3
		BIOL 140 - Principles of Biology I	4
		BIOL 141 - Principles of Biology II	4
		BIOL 240 - Introduction to Genetics	4
		BIOL 333 - Cell and Molecular Biology	4
		Elective (see above)	3

General Electives (Suggested Electives: PAR 320 (3), BIOL 291 (4), BIOL 292 (4), MATH 255 (4), MATH 270 (3), CS 150 (4))			**20**

Graduation Check

- ☐ 30 hours of 300-400 level classes at WCU
- ☐ Upper level perspective
- ☐ GPA in major ≥ 2.0
- ☐ 120 total hour

Updated: 08/27/2011 (CLH)

B.S. in Chemistry, ACS-Certified Concentration
Program Requirements (Effective Fall 2011)

Term	Grade	Course	Hours
Liberal Studies (C2 and C5 courses are met with major requirements)			**33**
		First Year Seminar, 190 or 191	3
		C1: ENGL 101 - Writing and Rhetoric	3
		C1: ENGL 202 - Writing and Critical Inquiry	3
		C3: CMHC 201 - Intro. to Speech Communication	3
		C4: Wellness	3
		*P1: Social Science, course 1	3
		*P1: Social Science, course 2 *(must be from a different discipline than course 1)*	3
		*P3: History	3
		*P4: Humanities	3
		*P5: Fine & Performing Arts	3
		*P6: World Cultures	3
		**Note: at least one of the LS perspectives must be at the junior-senior level*	

Chemistry Core			**45**
		CHEM 139 - General Chemistry I	4
		CHEM 140 - Advanced General Chemistry	4
		CHEM 232 - Quantitative Analysis	4
		CHEM 241 - Organic Chemistry I	3
		CHEM 242 - Organic Chemistry II	3
		CHEM 272 - Organic Chemistry Lab	2
		CHEM 352 - Physical Chemistry I	3
		CHEM 361 - Principles of Biochemistry	3
		CHEM 370 - Instrumental Analysis I	4
		CHEM 371 - Chemical Dynamics	2
		CHEM 495 - Seminar in Chemistry	1
		MATH 153 - Calculus I	4
		PHYS 230 - General Physics I	4
		PHYS 231 - General Physics II	4

ACS-Certified Concentration			**23**
		CHEM 321 - Inorganic Chemistry	3
		CHEM 380 - Research in Chemistry (take two 2-credit sections)	4
		CHEM 435 - Instrumental Analysis II	3
		CHEM 453 - Physical Chemistry II	3
		CHEM 472 - Chemical Syntheses	2
		MATH 255 - Calculus II	4
		MATH 256 - Calculus III	4

General Electives (Suggested Electives: PAR 320 (3), MATH 270 (3), ENGL 305 (3), CS 150 (4), CS 151 (4))			**19**

Graduation Check

☐ 30 hours of 300-400 level classes at WCU
☐ Upper level perspective
☐ GPA in major ≥ 2.0
☐ 120 total hour

Updated: 08/27/2011 (CLH)

B.S. in Chemistry, ACS-Certified Concentration (4+1 option)
Program Requirements (Effective Fall 2011)
See catalog for additional guidelines and requirements.

Term	Grade	Course	Hours
Liberal Studies (C2 and C5 courses are met with major requirements)			**33**
		First Year Seminar, 190 or 191	3
		C1: ENGL 101 - Writing and Rhetoric	3
		C1: ENGL 202 - Writing and Critical Inquiry	3
		C3: CMHC 201 - Intro. to Speech Communication	3
		C4: Wellness	3
		*P1: Social Science, course 1	3
		*P1: Social Science, course 2 *(must be from a different discipline than course 1)*	3
		*P3: History	3
		*P4: Humanities	3
		*P5: Fine & Performing Arts	3
		*P6: World Cultures	3
		**Note: at least one of the LS perspectives must be at the junior-senior level*	

Term	Grade	Course	Hours
Chemistry Core			**45**
		CHEM 139 - General Chemistry I	4
		CHEM 140 - Advanced General Chemistry	4
		CHEM 232 - Quantitative Analysis	4
		CHEM 241 - Organic Chemistry I	3
		CHEM 242 - Organic Chemistry II	3
		CHEM 272 - Organic Chemistry Lab	2
		CHEM 352 - Physical Chemistry I	3
		CHEM 361 - Principles of Biochemistry	3
		CHEM 370 - Instrumental Analysis I	4
		CHEM 371 - Chemical Dynamics	2
		CHEM 495 - Seminar in Chemistry	1
		MATH 153 - Calculus I	4
		PHYS 230 - General Physics I	4
		PHYS 231 - General Physics II	4

Term	Grade	Course	Hours
ACS-Certified Concentration			**23**
		CHEM 321 - Inorganic Chemistry	3
		CHEM 380 - Research in Chemistry (take two 2-credit sections)	4
		CHEM 535 - Instrumental Analysis II	3
		CHEM 553 - Physical Chemistry II	3
		CHEM 572 - Chemical Syntheses	2
		MATH 255 - Calculus II	4
		MATH 256 - Calculus III	4

Term	Grade	Course	Hours
General Electives (Suggested Electives: PAR 320 (3), MATH 270 (3), ENGL 305 (3), CS 150 (4), CS 151 (4), additional 500-level chemistry courses, additional CHEM 380 sections)			**19**

Graduation Check

- ☐ 30 hours of 300-400 level classes at WCU
- ☐ Upper level perspective
- ☐ GPA in major ≥ 2.0
- ☐ 120 total hour

Updated: 08/27/2011 (CLH)

Name: ________________________ 920#:____________ Semester/Year of Entry:__________

Undergrad Major:______________________ Undergrad Institution: ______________________________

Undergrad GPA:__________ GRE Score:______________ TOEFL Score: ___________

Thesis Advisor:________________________ Thesis Topic:_________________________________

Thesis Committee Members:____

Graduate Courses Taken Toward Degree – Minimum of 30 Hours

Required courses include:

9 hrs of core curricula selected form the following:

- CHEM532/570: Instrumental Analysis II (3)/Advanced Instrumental Analysis Lab(1)
- CHEM541: Advanced Organic Chemistry (3)
- CHEM553: Physical Chemistry II (3)
- CHEM621: Graduate Inorganic Chemistry (3)
- CHEM652: Graduate Physical Chemistry (3)

9 hrs of graduate electives:

- Courses selected in consultation with research advisor

12 hrs of:

- CHEM 696: Seminar
- CHEM 698: Research
- CHEM 699: Thesis

FIRST YEAR							
FALL				**SPRING**			
Course	**Course Title**	**Credit Hours**	**Grade**	**Course**	**Course Title**	**Credit Hours**	**Grade**
CHEM 696	Graduate Seminar	1		CHEM 696	Graduate Seminar	1	
TOTAL				TOTAL			
Research Progress Fall:				Research Progress Spring:			
Research Progress Summer:							
SECOND YEAR							
FALL				**SPRING**			
Course	**Course Title**	**Credit Hours**	**Grade**	**Course**	**Course Title**	**Credit Hours**	**Grade**
				CHEM 696	Graduate Seminar	1	
CHEM 696	Graduate Seminar	1		CHEM 699	Thesis	3	
TOTAL				TOTAL			
Research Progress Fall:				Research Progress Spring:			
Research Progress Summer(if necessary):							

THIRD YEAR (if necessary)							
FALL				SPRING			
Course	**Course Title**	**Credit Hours**	**Grade**	**Course**	**Course Title**	**Credit Hours**	**Grade**
CHEM 799	Continuing Thesis			CHEM 799	Continuing Thesis		
TOTAL				TOTAL			

Total Credits Accumulated Toward Degree:___________

Final GPA in MS program:_____________

Research Activities Performed Toward Degree

Thesis **Prospectus** Submission Date:_____________

Thesis **Prospectus** Approved by Committee? (Sign and Date if Approved)

Thesis Advisor:_______________________________________

Thesis Committee Member #1:____________________________

Thesis Committee Member #2:____________________________

Thesis **Defense** Date:___________________

Thesis **Defense** Approved by Committee? (Sign and Date if Approved)

Thesis Advisor:_______________________________________

Thesis Committee Member #1:____________________________

Thesis Committee Member #2:____________________________

MS Program Coordinator: _______________________________

Department Head: ____________________________________

Comments:

C.3 Course syllabi

Course syllabi for the following chemistry courses are included on the following pages:

- 139: General Chemistry I (page 45)
- 140: Advanced General Chemistry (page 49)
- 232: Quantitative Analysis (page 51)
- 241: Organic Chemistry I (page 54)
- 242: Organic Chemistry II (page 57)
- 272: Organic Chemistry Lab (page 59)
- 321: Inorganic Chemistry (page 61)
- 352: Physical Chemistry I (page 65)
- 361: Principles of Biochemistry (page 69)
- 370: Instrumental Analysis I (page 73)
- 371: Chemical Dynamics (page 76)
- 380: Research in Chemistry (page 81)
- 421: Advanced Inorganic Chemistry (page 85)
- 435: Instrumental Analysis II (page 89)
- 453: Physical Chemistry II (page 93)
- 472: Chemical Syntheses (page 98)
- 495: Seminar in Chemistry (page 101)
- 535: Instrumental Analysis II (page 105)
- 553: Physical Chemistry II (page 109)
- 561: Environmental Chemistry (page 114)
- 572: Chemical Syntheses (page 116)
- 593: Advanced Inorganic Chemistry (page 119)
- 696: Seminar in Chemistry (page 123)
- 698: Graduate Research in Chemistry (page 126)

CHEM 139 General Chemistry I – Fall 2011

139 03, NS 1, TR 9:30 – 10:45 AM   139 04, NS 308, TR 2:05 – 3:20 PM   139 06, BAC 130, MWF 9:05 – 9:55 AM

Instructor: Dr. Karen Butcher
Office: ST 417
Contact Info: 227-3654, kbutcher@email.wcu.edu
Office Hours: MTWTh 8:00 – 8:45; or by appointment

I. Course Description

In this course, you will study basic chemistry including such topics as atomic and molecular structure, chemical bonding, stoichiometry, acids and bases. The laboratory portion of this course will provide an introduction to experimentation. Three hours per week will be spent in lecture and three hours per week will be spent in the laboratory. This course is worth four credit hours.

This course partially satisfies the C5 science requirement of the WCU liberal studies program and contains a laboratory component. In the physical sciences, students will

- Be directed toward the definition and solution of problems involving the character of matter, energy, motion, or mechanical/dynamic systems
- Study in these courses concern scientific methods.

Laboratory work will be central to theoretical discussions as an experience in the character of scientific work, and will provide an opportunity to experience the environment in which scientific study is conducted.

II. Learning Objectives

By the end of this course, students will:

- Be able to use the periodic table.
- Understand atomic structure and bonding.
- Be able to name chemical compounds.
- Be able to balance chemical equations.
- Be able to calculate theoretical yields.
- Be able to predict the products that form as a result of mixing known reactants.
- Understand basic thermochemical relationships.
- Be able to use gas laws to determine the pressure, volume, or temperature of a gaseous system.

III. Course Materials

Reading material:

- Required text: Tro, Nivaldo J. *Chemistry: A Molecular Approach* 2nd ed. Upper Saddle River, New Jersey: Pearson Prentice Hall, 2011. (This text is available for ***rent*** from the University Bookstore.)
- CHEM 139 Laboratory Manual. (This text is available for ***purchase*** from the University Bookstore.)

Laboratory Supplies (available for ***purchase*** from the University Bookstore):

- Required Supplies: Goggles, gloves and carbonless copy laboratory notebook
- Optional Supplies: Safety glasses, lab apron or lab coat

IV. Faculty Expectations of Students and Course Policies

- Accommodations for students with disabilities:

  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact the Office of Disability Services for more information at (828) 227-3886 or lalexis@wcu.edu You may also visit the office's website: disability.wcu.edu

- Academic Honesty Policy (as described in the Student Handbook):

  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:

  a. *Cheating*—Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  b. *Fabrication*—Intentional falsification of information or citation in an academic exercise.
  c. *Plagiarism*—Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
  d. *Facilitation of Academic Dishonesty*—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction.

  Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.

- Inclement weather policy (as described in the Student Handbook) :

  The University does not, as a matter of general practice, close its operations or cancel classes in Cullowhee because of bad weather. Many Western students commute from different distances and directions and weather conditions for those students may vary greatly from conditions on the Cullowhee campus. Students are advised to check road conditions in their areas and determine whether it is reasonable for them to drive to campus. The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions. Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions.

  Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- Blackboard:

  Blackboard, an online course management system, will be used as a source for important announcements, class handouts, review material, and quizzes. You will also be able to check your grades for all assignments at any time.

  To access Blackboard, log in to MyCat using your 92-number and your PIN. Click the Blackboard link on the left side of the screen or, under the Personal Services tab, select Student Main Menu and follow the Balckboard link. You will see all of your courses at that time including CHEM 139 lecture and CHEM 139 lab. Please let your instructor know if you have any trouble accessing the course in Blackboard.

  Your instructor will communicate any important class information to you via Blackboard. Please check Blackboard regularly during the semester.

- Tutoring:

  Tutoring for CHEM 139 is available free of charge through the WaLC (see below). Students who use the WaLC for CHEM 139 will be awarded 2 bonus points on the next exam for every 1 hour of tutoring (maximum of 6 bonus points per exam). BONUS POINTS WILL ONLY BE AWARDED FOR TUTORING THROUGH THE WaLC.

  The Writing and Learning Commons (WaLC) seeks to enhance the academic environment and raise the level of academic discourse at WCU by providing tutoring, academic skills consultations, workshops, online learning resources, and faculty consultations. …Course tutors facilitate collaborative group sessions and offer strategies for effective study and efficient time management. Call 227-7197 for writing appointments and 227-2274 for course tutoring. Visit the website, http://walc.wcu.edu, for additional learning and writing resources, hours of operation, and appointment information. All consultations and tutoring sessions take place in 30 Hunter Library.

- Classroom Etiquette:

  Class attendance is STRONGLY encouraged. However, you should be respectful of your fellow students as well as your instructor and avoid behavior which may disrupt the class. It is recommended that you bring a calculator to each class and use it frequently, but please do not use any other electronic devices during class (computers, cell phones, mp3 players etc). Please be on time for class and do not leave class early. If you have questions or comments during class, I encourage you to bring these to my attention, but please do not engage in conversations with your neighbor during class. If you feel that you have a legitimate reason for not adhering to these guidelines, let me know.

- Quizzes and Homework:

  Quizzes will be posted on Blackboard at 5:00 PM every Friday and will be due the following Friday at 5:00 PM. You must notify me of any problems with the quiz at least 24 hours before the quiz closes. NO EXTENSIONS WILL BE GRANTED.

  Practice problems from the text book will be assigned regularly. Practice problems will not be graded. You will be given 1-2 short homework assignments each week which are to be turned in on a 8.5" X 5.5" sheet of paper at the beginning of the next class meeting. Homework assignments will be graded. You will be given one grade for every 5 homework assignments.

- Exams:

  Four exams will be given in class (see schedule below).

- Laboratory

  Eleven experiments will be performed over the course of the semester. You must attend your assigned laboratory section and complete all of the assigned work for the lab. Please see the CHEM 139 Laboratory Manual for specific lab policies. The lab schedule is posted on Blackboard (under your CHEM 139 lab section).

- Final Exam:

  The final exam is scheduled by the University (see schedule below). The final exam is cumulative.

- Make- Up Policy

Make-up work is not accepted in CHEM 139 and make-up quizzes and make-up exams will not be allowed. To allow for extenuating circumstances the following policies are in effect:

- Quizzes- Two quiz grades will be dropped from your quiz average
- Homework- One out of every five homework grades will be excused.
- Exams- If it is to your advantage, your lowest exam grade will be replaced with your grade on the final exam.
- Laboratory- one lab grade will be dropped from your average
- Final Exam- missed final exams will be handled on a case by case basis

V. Grading Procedures:

Final grades will be based on a weighted average as shown below:

	Percentage of Final Grade
Quizzes and homework	20%
Exams	40%
Final Exam	20%
Laboratory	20%

Letter grades will be assigned as follows:

Weighted Average	**Letter Grade**	**Weighted Average**	**Letter Grade**	**Weighted Average**	**Letter Grade**	**Weighted Average**	**Letter Grade**
>96%	A+	87% - 89%	B+	77% - 79%	C+	67% - 69%	D+
93% - 96%	A	83% - 86%	B	73% - 76%	C	63% -66%	D
90% - 92%	A-	80% - 82%	B-	70% - 72%	C-	60% - 62%	D-
						<60%	F

VI. Course Schedule

Exam Schedule:

	Sections 03 and 04	Section 06
Exam 1	September 13	September 14
Exam 2	October 6	October 7
Exam 3	November 8	November 7
Exam 4	December 6	December 7
Final Exam	139-03 December 14 @ noon	December 13@ 8:30 AM
	139-04 Decmber 12 @ noon	

A tentative daily schedule is posted in Blackboard.

CHEM 140, Fall 2011
ADVANCED GENERAL CHEMISTRY
Section-01 TR: 9:30 – 10:45 Belk 183
Section-02 MWF: 11:15 – 12:05 Belk 304

Jack Summers, Office: ST 408 (Across from Chem Lab), Office hours MW 9:00 – 11:00, TR 11-12 or by appointment. Office phone: 3668, Email: summers@email.wcu.edu

Text: CHEMISTRY, a Molecular Approach, 2nd Ed., N.J. Tro, Prentice Hall, Upper Saddle River, NJ, 2008.

GENERAL COURSE DESIGN Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an appetite to learn. You are expected to participate in all class activities by: reading assigned material; doing homework; participating in classroom discussions (may require a calculator, so bring one); and contributing in any way that will benefit you and the class. Attendance is mandatory, participation in class is expected and failure to do so will result in a lowering of your grade. I will not necessarily lecture on all text material, but you are responsible for all assigned topics.

GRADING The overall course grade will be based on the laboratory (20%), 3 hour exams (55%), the comprehensive final examination (20%), daily homework assignments, participation, quizzes (5%). **If you know in advance that you will miss a test, contact the instructor before the test. If you are unable to make a test and unable to contact the instructor before the test, then contact me as soon after the test as possible.** Failure to take a test before it is returned to the class requires that I create a new test. Since no data will be available for the new test, the new test will not benefit from a curve. The course will be graded 100-93=A; 92-90=A-; 89-86=B+; 85-82=B; 81-79=B-; 78-76=C+; 75-73=C; 72-68=C-; 67-63=D+; 62-60=D; 59-55=D-; 54 or below=F.
Quiz Policy: If fewer than 70% of the class is in attendance, there will be a quiz. Quizzes can also be triggered by a breach in student etiquette. Examples include if a cell phone rings in class, if anyone goes to sleep during class or any behavior that is disrespectful of the class.

TUTORING Tutors are available at no cost through the Writing and Learning Commons (WaLC). The WaLC is located on the ground floor of Hunter Library (room 30). Tutors for CHEM 140 are upper class students who did well in CHEM 140 in the past. The WaLC seeks to enhance the academic environment and raise the level of academic discourse at WCU by providing tutoring, academic skills consultations, workshops, online learning resources, and faculty consultations. Course tutors facilitate collaborative group sessions and offer strategies for effective study and efficient time management. Writing Assistants collaborate with students from all classes and majors at every stage of the writing process, from brainstorming and prewriting to drafting and revising. Call 227-7197 for writing appointments and 227-2274 for course tutoring. Visit the website, http://walc.wcu.edu, for additional learning and writing resources, hours of operation, and appointment information. All consultations and tutoring sessions take place in 30 Hunter Library. Distance students should use Smarthinking, an online tutoring service available via Blackboard, and WaLC's online resources.

COMMENTS Success in this course demands that you spend time on the course material out of class. There are many example problems in each chapter and problems and questions covering the material at the end of each chapter with answers to selected problems in appendix F. You must gain the experience of working these problems on your own. Of course I will be happy to assisting you if you ask.

I will make every effort that I can to make general chemistry a usefully informative and enjoyable experience. I fully expect you to meet me more than half way in this as I expect you to read, work out of class, and participate in class proceedings. Do these things and we both will be satisfied, don't do them and we both will be disappointed. Please do not hesitate to ask questions either during class, during lab, during my office hours or by email.

Academic Honesty: The university considers cheating, fabricating information, plagiarizing materials, and helping other students to cheat, fabricate or plagiarize materials to be academic dishonesty. Cases of academic dishonesty will be dealt with according to university polices as described at: http://catalog.wcu.edu/content.php?catoid=20&navoid=346#honestypolicy.

Liberal Studies Core Requirement: This course partially satisfies the C5 science requirement of the WCU liberal studies program and contains a laboratory component. In the physical sciences, students will be directed toward the definition and solution of problems involving the character of matter, energy. Laboratory work is central to understanding scientific work. The lab section of this course will provide an opportunity to experience the environment in which scientific study is conducted.

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

CoursEval: Student assessment of courses will be done online using the CoursEval program. You will be reminded by the university when CoursEvals open and close.

TENTATIVE COURSE SCHEDULE

Below is a tentative outline for the course. Problems at the end of each chapter are divided according to text section, so address the problems appropriate to the sections we cover.

Review: Chapters 3, 4, 7, 8, 9

Chapter 10 Molecular Structures.

Chapter 11 – Liquids, Solids, Intermolec. Forces

Chapter 12 – Solutions

Chapter 13 – Chemical Kinetics

Exam 1 –tentative date: 9/21-22

Chapter 14 – Chemical Equilibrium

Chapter 15 –Acids and Bases;

Exam 2 –tentative date 10/25-26

Chapter 16 Aqueous Equilibria

Chapter 17 – Free energy and Thermochemistry

Chapter 18 – Electrochemistry

Exam 3- tentative date 11/30-12/1

FINAL EXAMs:

Sect 01-Wed, 12/14, 12:00-2:30

Section 02-Mon, 12/12, 3:00-5:30

Western Carolina University
CHEM232: Quantitative Analysis

Fall 2011

Course Information

- Lecture: MW 3:05-04:25 NS 308
  - Lecture Instructor: Scott W. Huffman, Ph.D.
  - Office: Natural Science Building Room 224
  - Phone: 227-3669
  - Email: shuffman@wcu.edu
  - Office Hours: Thursday 3-4:30pm and Friday 9-10am or by appointment
  - Website: http://paws.wcu.edu/shuffman/
- Text: Quantitative Chemical Analysis by Danial Harris 8th Edition.

Course Description and Prerequisites

This course is an introduction to analytical and equilibrium physical chemistry, and data analysis. The prerequisites of this course are a C in CHEM 140 and a C in MATH 140, 146, 153 or higher .

Learning Objectives

- to extract chemical information from data
- to use statistics to provide confidence in chemical information
- to know which chemical rxns in a given chemical system are important and why
- to understand the concepts of method development (with in a limited set of measurements)

Grade Determination

Assignment	Percentage
Hour Exams	50
Final Exam	10
Lab [a]	20
Quiz and Homework	20
Total	100

a: Note: You must pass the lab to pass the class.

Final Grading Scale

Grade	Grade
90-100	A
80-89	B
70-79	C
60-69	D
< 60	F

Homework Problems, Quizzes, Discussion, and Attendance

In general homework will be assigned from the text, webcat, or from handouts to guide you toward learning the material and developing the skills required in this course and will only sometimes be graded. A quiz may be given at the beginning of the class period. These quizzes will be a review of previously covered materials.

The only legitimate excuses to miss a class is participation in a university sanctioned trip (in which case you need to provide written documentation ahead of time). Attendance is not mandatory, but **STRONGLY** recommended. If you miss class, you will miss the material for that day, and there are **NO** makes ups.

Exams

Attendance for all exams is mandatory there are no makes ups. Tentative hour exam dates are

Exam	Date
Exam 1	Sept 19
Exam 2	Oct 24
Exam 3	Nov 21
Final Exam	Cumulative Friday Dec 16,2011, 8:30-11:00 am

Academic Honesty Policy (as described in the Student Handbook):

Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:

- Cheating

Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.

- Fabrication

Intentional falsification of information or citation in an academic exercise.

- Plagiarism

Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.

- Facilitation of Academic Dishonesty

Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction. Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.

Inclement weather policy (as described in the Student Handbook) :

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Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

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Mobile Communication Devices Policy

Mobile communication devices are prohibited in the class and the laboratory. If I see you using a mobile communication device during an exam or quiz, I will assume you are cheating, and you will receive a zero on the assignment.

Fall 2011

Monday, Wednesday, and Friday 10:10 to 11:00 AM
BL-304, the Belk Building

Text (required): *Organic Chemistry,* 5th Edition by Marc Loudon.

Supplementary materials (Suggested, but not required): A model kit. The one I will use in class is made by Darling Models and can be found at http://www.darlingmodels.com. One kit I can recommend from this manufacturer is **Kit #3 Organic Model Set** (ISBN 0-9648837-4-0) for $13.25 each. There are also many other model kits available on the internet that may be less expensive; if you have any questions about them, please contact me.

The *Study Guide and Solutions Manual, 5th edition* (ISBN 9780981519449) by Marc Loudon to accompany the text. It is available for about $50 from the publisher and also at various on-line sites.

Instructor: William R. Kwochka

Where to find me: NSB 225 (office), phone: 3673 (direct line) or 7260 (department)
E-mail: kwochka@wcu.edu (probably the best way to get in touch with me)
WWW: http://www.wcu.edu/4469.asp (still under construction)

Office Hours: Wednesday and Friday from 11:00 to 12:30 AM or by appointment.

Course Description: CHEM 241 is the first semester of a two-semester sequence designed to introduce you to organic chemistry. Organic chemistry is the branch of science that deals generally with compounds of carbon. We will explore the nature of this science (the physical composition and reactions of molecules) as well as the relevance of organic chemistry to society. Success in this course will require a lot of time on your part. **I recommend spending at least one hour per night studying and doing problems; two hours would be better.** There is a tremendous vocabulary associated with organic chemistry and it is essential that you learn this language in order to learn the chemistry. Since I have spent quite a bit of time studying organic chemistry, I have some advice that may be of help to you:

- Start studying on Day 1 and don't let up. Organization is the key to success in this course.
- DO THE PROBLEMS! Although the material in the text is very important, you will not learn the chemistry simply by reading the chapter. In my experience, the best way to learn the chemistry covered in lecture is to do the following:
    1. Work out all the *Study Problems* within the chapter.
    2. Work out the *suggested Problems* within each chapter.
    3. Work out the *suggested Problems* at the end of each chapter.

  Answers to the problems marked by bold-faced type can be found in the *Study Guide and Solutions Manual*. This solutions manual is available over the internet and is on reserve at the library. *I will not collect or grade these problems, but I guarantee that some of them will be on quizzes and exams*.
- Study in groups.
- Use the CAT center.
- Ask questions in class.
- Purchase or borrow a plastic molecular modeling kit.

Grading Policy: There will be **four** one-hour exams and a cumulative final exam; one *one-hour exam score will be dropped*. Exams may not be taken other than scheduled times. If you let me know a week ahead of time about needing to miss an exam, we can make other arrangements for you take the exam BEFORE the scheduled exam. However, no exam may be taken AFTER the scheduled exam. The concepts in organic chemistry build upon one another and it is impossible to ignore previous material. The exams will reflect this philosophy. Exams are scheduled for the following dates: **Exam 1** on September 16, **Exam 2** on October 12, **Exam 3** on November 11, **Exam 4** on December 7, and the **Final Exam** is scheduled for Wednesday, December 14 at 8:30 AM. In addition, there will be a quiz during the last 10-15 minutes of class every Friday, except the week in which an exam is scheduled. **No quiz can be taken other than the scheduled time.** There will be a total of approximately 8 quizzes for the semester; *the two lowest quiz scores will be dropped*.

Three one-hour exams @ 100 points each	300 points
Cumulative final exam @ 100 points	100 points
Eight quizzes @ 10 points each	80 points
Total Possible Points	480 points

I will be using the +/- grade system to determine the final grade. The grade scheme is as follows;

A = 100-93	**C** = 76.9-73
A- = 92.9-90	**C-** = 72.9-70
B+ = 89.9-87	**D+** = 69.9-67
B = 86.9- 83	**D** = 66.9-63
B- = 82.9-80	**D-** = 62.9-60
C+ = 79.9-77	**F** = 59.9 and below

Course Outline: The following is a *tentative* schedule for the fall semester:

I	Chapter 1	*Chemical Bonding and Chemical Structure* (about 1 week) **Omit sections 1.5, 1.8**
II	Chapter 2	*Alkanes* (about 1 week) **Omit section 2.8**
III	Chapter 3	*Acids and Bases. The Curved-Arrow Notation* (about 1 week)
IV	Chapter 4	*Introduction to Alkenes. Structure and Reactivity* (about 1 week)
V	Chapter 5	*Addition Reactions of Alkenes* (about 1 week)
VI	Chapter 6	*Principles of Stereochemistry* (about 1.5 weeks) **Omit sections 6.5, 6.8, 6.9, 6.12**
VII	Chapter 7	*Cyclic Compounds. Stereochemistry of Reactions* (about 1.5 weeks) **Omit sections 7.6 – 7.8**
VIII	Chapter 8	*Introduction to Alkyl Halides, Alcohols, Ethers, Thiols, and Sulfides* (about 1 week) **Omit sections 8.5, 8.9**
IX	Chapter 9	*Chemistry of Alkyl Halides* (about 1.5 weeks) **Omit section 9.8**
X	Chapter 10	*Chemistry of Alcohols and Thiols* (about 1.5 weeks) **Omit sections 10.5, 10.8, 10.9**
XI	Chapter 11	*Chemistry of Ethers, Epoxides, Glycols, and Sulfides* (about 1 week, if we have time) **Omit sections 11.2 – 11.10**

There will be no class on **September 5** (Labor Day), **October 14, 17** (Fall Break), **November 2** (Advising Day), or **November 23, 25** (Thanksgiving).

Tutoring Services: The Catamount Academic Tutoring (CAT) Center offers FREE small-group tutoring and Academic Skill Workshops to help students improve their study techniques. Sign up for appointments in advance using the online scheduling system (www.wcu.edu/catcenter/schedule.htm), by calling 227-2774, or by visiting the center in 30 Hunter Library (ground floor). Students are expected to arrive for tutoring sessions on time and prepared with class notes, readings, assignments, and a list of questions they have about the material. A schedule of Academic Skill Workshops is available on the Web site: www.wcu.edu/catcenter/workshops.html.

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Good luck with the chemistry!

Organic Chemistry II CHEM 242 - 01
Western Carolina University

Fall 2011

Time and Location:	Mon / Wed / Fri 10:10 to 11:00 am Natural Sciences 1
Text (required):	*Organic Chemistry,* 6th Edition by John McMurry
Supplementary material: (suggested, not required)	*Study Guide and Solutions Manual for Organic Chemistry, 6th edition* ISBN 0-534-40934-2 Can be found at several sites on the web, and on reserve in the library. Model kit. Darling Models **Kit #3 Organic Model Kit** (ISBN 0-9648837-4-0) is available on-line (http://www.darlingmodels.com) or from me for $15.00.
Instructor:	Dr. Charles Marth *Office*: NS 228 *phone*: 227-3674 *E-mail*: marth@email.wcu.edu *website:* see Blackboard
Office Hours:	Mondays 1:10 – 2:00 pm Tues/Thurs 11:00 – 12:00 noon Fridays 9:00 – 10:00 am Other times by appointment, or when you can find me

Course Description: CHEM 242 is the second semester of a two-semester sequence designed to introduce you to organic chemistry. The second semester will focus on the chemistry of specific functional groups. There will be large number of reactions to learn as we go through the semester. Success will require that you devote large amounts of study time to this course. I recommend spending at least 1-2 hours per night studying and doing problems. There is a tremendous amount of material to cover.

Specific Learning Objectives: This semester, you should gain an understanding of different functional groups, their properties, and their reactions. You will need to apply this information on reactions to synthesize target molecules. You should be able to analyze spectral data to solve structural problems. You will also obtain knowledge of important classes of biological molecules.

Study Hints:

- Start studying on Day 1 and don't let up. Keeping up with reading and problems is key to success in this course. Don't get behind! Also study in groups.
- DO THE PROBLEMS!!! Although material in the text is important, you will not learn the chemistry by just reading the chapter. You must do the assigned problems for each chapter. Answers to problems within the chapter are in the back of the book. Solutions to problems at the chapter end can be found in the *Study Guide* by McMurray, which is on reserve at the library. Some of these problems will be on quizzes and exams.
- Purchase a plastic molecular modeling kit. This is very important to help you visualize the structure of organic compounds and the conformational changes that they undergo.
- Review the chapter in the book **before** it is covered in class. If you are somewhat familiar with the material, you can take better notes and ask relevant questions during the lecture.
- Ask questions during lecture. I like to keep an open a dialogue in class. For extra help, please see me in office or make use of the tutoring offered by the CAT center.

Organic Chemistry II CHEM 242 - 01
Western Carolina University

Grading Policy There will be **four** one-hour exams and a cumulative final exam. One exam score will be dropped. **No exam may be taken other than the scheduled time**. In addition, there will be six quizzes given this semester. The lowest quiz score will be dropped from your final grade. There is a cumulative final exam, and I will also collect and record the ***required*** homework problems for points. The final exam is scheduled for Wed, Dec. 14 at 8:30am and will cover the entire semester.

Three one-hour exams @ 100 points each	300 points	
Final exam @ 200 points	200 points	
Five quizzes @ 20 points each	100 points	
Total Possible Points	600 points	(plus homework)

Course Outline: The following is a *tentative* schedule for the fall semester:

Chapter 11	*Reactions of Alkyl Halides: Nucleophilic Substitutions and Eliminations* (review)
Chapter 8	*Alkynes: An Introduction to Organic Synthesis* (partial chapter)
Chapter 13	*Structure Determination: NMR Spectroscopy*
Chapter 10/14	*Alkyl Halides / Conjugation* (partial chapters)
Chapter 15	*Benzene and Aromaticity*
Chapter 16	*Chemistry of Benzene: Electrophilic Aromatic Substitution*
Chapter 17	*Alcohols and Phenols* (plus part of Chapter 18)
Chapter 19	*Aldehydes and Ketones: Nucleophilic Addition Reactions*
Chapter 20	*Carboxylic Acids and Nitriles*
Chapter 21	*Carboxylic Acid Derivatives and Nucleophilic Acyl Substitution Reactions*
Chapter 24	*Amines* (partial chapter)
Chap. 25 and 26	*Biomolecules* (selected sections)

Please feel free to ask questions. I am open to answering questions any time during class. Some answers may require that we meet separately. If you have problems, see me during office hours or make an appointment. Tutor hours will also be available. **Homework** for each chapter is required. I will collect it before each exam. Check the PAWS web page for updates on assignments and review sheets. We can hold review sessions before exams, if desired.

Remember that there will be a large amount of material to learn this semester. To learn and understand all this material will require serious effort. If you have problems or questions, see me during office hours or make an appointment. Free tutoring is also available from the **Writing and Learning Commons (WaLC)**. Tutors facilitate collaborative group sessions and offer strategies for effective study and efficient time management. Call x2274 or go to http://walc.wcu.edu for hours of operation and appointments. All consultations and tutoring sessions take place in 30 Hunter Library..

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Organic Chemistry Lab CHEM 272 - 33
Western Carolina University

Spring 2011

Time and Location:	Tues / Thurs 8:00 to 10:50 pm	Stillwell 419
Text:	*Modern Projects and Experiments in Organic Chemistry: Miniscale and Williamson Microscale* by Mohrig, Hammond, Morrill, Schatz, and Morrill; W. H. Freeman and Company, New York, **2003**.	
What you will need:	a pair of safety goggles or glasses a 50 page carbonless laboratory notebook a bag of 30 (or box of 100) nitrile gloves (these items are all available at the WCU bookstore)	
Instructor:	Dr. Charles Marth *Office*: NS 228 *E-mail*: marth@email.wcu.edu	 *phone*: 227-3674 *website:* Chem 272 - Blackboard
Office Hours:	Mon 9:00 – 10:00 am Wed 12:30 – 1:30 pm Tues/Thurs 11:00 – 12:00 pm	 Other times by appointment, or when you can find me

Course Description: This lab course is designed to enhance your CHEM 241/242 class experience by putting into practice the concepts learned in lecture and serve as an introduction to research in organic chemistry. We will begin by synthesizing simple organic molecules that do not require very delicate procedures and move toward more complicated reactions that require good technical skill. This course will emphasize the techniques involved in synthetic chemistry such as running the reaction, workup of the reaction, purification of the reaction product, and, finally, characterization of that material.

Grading Policy: There are no exams in this course. The final grade will be based upon a report (either a formal lab write-up or a worksheet) of each of the synthetic schemes along with, your lab notebook. The grade scheme for the course is as follows; **A** = 100-93, **A-** = 93-90, **B+** = 90-87, **B** = 87- 83, **B-** = 83-80, **C+** = 80-77, **C** = 77-73, **C-** = 73-70, **D+** = 70-67, **D** = 67-63, **D-** = 63-60, **F** = 60 and below.

Each report will usually be due one week after the experiment is completed. More information about the specific requirements for each experiment will be provided at the appropriate time. Late reports will be penalized **five percent per day**, excluding weekends. For the first formal lab write-up (the ethanol lab), you will be given the opportunity to revise your report for a better grade. *All rewrites must be accompanied by the original draft and grade sheet.* Rewrites that are missing the original draft and grade sheet will be considered late and points deducted accordingly.

Safety in the organic lab, especially **eye safety**, is vital. Once you enter the organic lab you will be expected to follow the safety guidelines at all times. On the subject of writing, everything having to do with the lab is to be written directly into your lab notebook, including all observations and calculations, in blue or black ink. Do **not** use any loose sheets or scratch paper to record information. Both of these issues will be discussed in more detail during the first lab. Failure to adhere to the guidelines will result in points deducted from the overall grade in the course.

Remember to come to lab prepared each week. You should read the lab and any assigned experimental technique handouts. Also, you must have your notebook table completed. Pop quizzes at the start of lab will help make sure you come prepared.

Organic Chemistry Lab CHEM 272 - 33
Western Carolina University

Course Outline: Some experiments will require short setup times with little time actually spent performing the reaction; others may need constant attention. The bottom line in each of these synthetic schemes is that you must obtain the product. However, despite our best efforts, the experiments don't always work the first time. In this case, it is your responsibility to inform the instructor and work out a plan. If the problem is caught soon enough, you can simply redo the experiment with no cost to you other than more time spent in the lab. Otherwise, if no product is obtained, points will be deducted from your report. The following is a ***tentative*** schedule for labs during the semester:

1. **Handout** Dyes: Preparation and Use of Indigo *(2 days)*
2. **Experiment 3** Synthesis of Ethanol by the Fermentation of Sucrose *(2 days)*
3. **Experiment 12.1** Synthesis of Esters from Alcohols: Isopentyl Acetate *(3 days)*
4. **Handout** Isolation of a Natural Product: Maltol *(2 days)*
5. **Handout** Ether Syntheses: The S_N1 and S_N2 reactions *(4 days)*
6. **Handout** Diels-Alder Reaction: 9,10-Dihydroanthracene-9,10-α,β-Succinic Acid Anhydride *(2 days)*
7. **Project 14** Sugars: The Glucose Pentacetates *(3 days)*
8. **Experiment 21** Acylation of Ferrocene *(2 days)*
9. **Project 11** Aldol Dehydration Chemistry *(2 days)*

Students with Disabilities: WCU is committed to providing equal educational opportunities for students with documented disabilities. Students who require accommodations must identify themselves as having a disability and provide documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex. You may also visit the office's website: http://www.wcu.edu/12789.asp

Pregnancy: Any student who is pregnant or may become pregnant should notify her TA or instructor before completing any laboratory work so that proper safety precautions can be taken. (Certain chemicals can harm unborn children.)

Academic Honesty As a community of scholarship and honor, all WCU faculty and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense because it threatens the quality of scholarship and defrauds those who depend on knowledge. Academic dishonesty includes cheating, fabrication, and plagiarism. Instructors will determine the appropriate sanctions for academic dishonesty, up to and including a failing grade. See the Student Handbook for complete details.

There will be no class on **Jan. 17** (MLK holiday), **Feb. 22** (Advising Day) or **Apr. 20-22** (break)

Syllabus - CHEM 321(Inorganic Chemistry) - Fall 2011

Course Information

Lecture Meeting Time: Mon, Wed, Fri at 9.05 am – 9.55 am Location: BL 253

Lecture Instructor: Dr. Channa De Silva Office: NS 213 Phone: 828-227-3637

Email: mhdesilva@wcu.edu

Office Hours: Mon (10:00 – 11:00 AM) and Fri (1:00 – 2:00 PM)

Text: Inorganic Chemistry by Shriver & Atkins' Fourth edition.

Supplementary Reading: Any Inorganic Chemistry text book and Inorganic Chemistry journal articles. Relevant lecture materials, homework assignments, and quizzes will be posted on blackboard.

Course Description and Purpose

This course is an introduction to inorganic chemistry concepts. The course materials are designed to develop students' knowledge on interdisciplinary areas of inorganic chemistry. The course materials will include a comprehensive examination of the physical and chemical properties of inorganic materials with an emphasis on atomic and molecular structure, molecular symmetry, acid-base concepts, redox chemistry, *d*-block and *f*-block elements, spectroscopy, and bioinorganic chemistry.

Course Objectives

Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an excitement to learn. You will participate in all class activities by: reading assigned material; doing homework and presentations; participating in classroom discussions; and contributing in other creative ways for the benefit of you and the class.

Specific learning objectives include (1) understanding of the principles useful for predicting and explaining descriptive inorganic chemistry (2) development of inorganic chemistry related problem solving skills, (3) development of scientific reasoning skills, and (4) applications to inorganic chemistry-related sciences.

Class Attendance

Attendance is required. Your grade may be reduced if you miss more than three classes. Cell phones must be turned off during lecture hours except emergency situations. Violations may result in loss of credit for the course. You may also be asked to leave the lecture hall. Web browsing and other computer-related activities are not allowed during the lecture hours.

Communication
Your instructor will communicate any important class information to you via email. Email will be sent to your WCU account. You are responsible for keeping this account open. If you use another email account, it is your responsibility to forward email from your WCU account to the one you use more frequently. **Email messages will not be sent directly to non university accounts.** Please check your email regularly during the semester.

Exams
Three hourly exams will be given in addition to the final exam. There will be no make-up exams. All exams will be given in the room where your lecture normally meets.

Homework, Reading assignments, Participation, and Quizzes
Homework and reading assignments will be assigned. You are expected to participate in class discussions and complete reading assignments. Late homework will NOT be accepted.

Grade Determination

Assignment	Points
Exam 1	100
Exam 2	100
Exam 3	100
Final Exam	200
Homework and Quizzes	50
Class Participation	50
TOTAL	600

Grading
Final grades will be based on percentage of the total points from three hourly exams, the final exam, and other assignments as shown above. The grade scheme for CHEM 321 is as follows; **A** = 100-93, **A-** = 93-90, **B+** = 90-87, **B** = 87- 83, **B-** = 83-80, **C+** = 80-77, **C** = 77-73, **C-** = 73-70, **D+** = 70-67, **D** = 67-63, **D-** = 63-60, **F** = 60 and below.

Outline of the Topics

- Chapter 1: Atomic Structure
- Chapter 2: Molecular Structure and Bonding
- Chapter 3: Structure of Simple Solids
- Chapter 4: Acids and Bases
- Chapter 5: Oxidation and Reduction
- Chapter 6: Molecular Symmetry

- Chapter 7, 21: Coordination Chemistry
- Chapter 19, 20: The *d*-Metal Complexes
- Chapter 23: The *f*-block Metals (Lanthanide Chemistry)

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a) **Cheating—**intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
b) **Fabrication—**intentional falsification of information or citation in an academic exercise.
c) **Plagiarism—**intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
d) **Facilitation of Academic Dishonesty**—intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his /her department head and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction. Please see the Student Handbook for more details.

Inclement weather policy (as described in the Student Handbook)
The University does not, as a matter of general practice, close its operations or cancel classes in Cullowhee because of bad weather. Many Western students commute from different distances and directions and weather conditions for those students may vary greatly from conditions on the Cullowhee campus. Students are advised to check road conditions in their areas and determine whether it is reasonable for them to drive to campus. **The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions.** Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions.

Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

Accommodations for Students with Disabilities
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Good Luck and Enjoy Inorganic Chemistry ☺

CHEM 352 Physical Chemistry I
Spring 2011
MWF 9:05-9:55, ST 437

Instructor: Dr. Carmen Huffman
Office: NS 212
Contact Info: 227-3682, chuffman@wcu.edu
Office Hours: MW 10:00-12:00 or by appointment

Course Description In this course, you will study chemical applications of thermodynamics. Two and a half hours per week will be spent in lecture. This course is worth three credit hours. Prerequisites: CHEM 242 and either MATH 140 or MATH 153. (Calculus is an important component for this course. If you have concerns about your math background, please see me right away.)

Learning Objectives By the end of this course, you will

- understand how to use equations of state.
- know the three "Laws of Thermodynamics".
- be able to apply calculus to chemical thermodynamics.
- be able to calculate work, heat, and changes in internal energy, enthalpy, entropy and free energy for various processes.
- be able to predict the phases of substances depending on conditions of pressure, temperature, and a substance's thermodynamic properties.
- understand conditions of equilibrium.

Course Materials Materials for this course are listed below.

- Required text: Atkins, Peter, and Julio de Paula. *Physical Chemistry 7th ed.* New York: W. H. Freeman and Company, 2002. (This text is available for rent from the University Bookstore.)
- POGIL handouts, distributed in class and available via Blackboard.

Faculty Expectations Expectations of students and course policies are listed below.

- **Accommodations for students with disabilities**: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

- **Academic honest policy (as described in the Student Handbook)**: Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  - *Cheating* – Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  - *Fabrication* – Intentional falsification of information or citation in an academic exercise.
  - *Plagiarism* – Intentionally or knowingly representing the words or ideas of someone else as ones own in an academic exercise.
  - *Facilitation of Academic Dishonesty* – Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of F in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction.

  Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.

- **Inclement weather policy (as described in the Student Handbook)**: The University does not, as a matter of general practice, close its operations or cancel classes in Cullowhee because of bad weather. Many Western students commute from different distances and directions and weather conditions for those students may vary greatly from conditions on the Cullowhee campus. Students are advised to check road conditions in their areas and determine whether it is reasonable for them to drive to campus. *The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions.* Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions.

  Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises.

Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- **Blackboard**: Blackboard will primarily be used as a source for handouts, study guides, old exams, and other important materials you can use to prepare for exams. You will also be able to check your grades for all assignments at any time. Please let me know if encounter difficulty accessing the course materials on Blackboard.
- **Communication**: Your instructor will communicate any important class information to you via email to your WCU account only. A test email will be sent early in the semester to verify the class roll. Please check your email regularly during the semester.
- **Attendance Policy**: Attendance to class is mandatory and will be monitored via daily quizzes. The two lowest quiz grades will be dropped to account for excused absences. As a courtesy, please notify me *as soon as possible* if you know you will be absent or have missed a class. This is especially important if you know you will be absent for an extended period of time due to illness or other unusual circumstances.

POGIL Process-oriented guided-inquiry learning (POGIL) will be used to teach this course. This is a teaching strategy where students work in learning teams to explore and identify concepts and apply them to solving problems. You're probably not familiar with this method, and may find difficult in the beginning. However, research has shown that this method is powerful in helping students understand and retain chemical concepts, and I believe (or at least hope) that, at the conclusion of this course, you will wish every course was taught in this manner. An additional handout with more details about this method will be provided.

Graded Work Your learning in this course will be evaluated by various graded coursework, listed below.

- **Homework**: Assignments will be given regularly (likely daily) in this course, as the only way to learn the material is to immerse yourself in it. All assignments must be turned in at *the beginning* of the class period in which it's due. A few problems from the assignment will be graded (at random). Graded assignments will be passed back to you. **Homework is worth 20% of your course grade.**
- **Quizzes**: Quizzes will be given regularly (likely daily) in this course. Topics will be based on the previous class day's POGIL exercise. **Quizzes are worth 10% of your course grade.**
- **Exams**: There will be four in-class exams. All exams are mandatory, but the lowest exam grade is dropped. Exam dates: W 02/02, W 02/23, W 03/23, and M 04/18. **Exams are worth 45% of your course grade.**

- **Final exam**: The final exam is scheduled for Tuesday, May 3^{rd}, 8:30-11:00. The exam will be cumulative. **The final exam is worth 25% of your course grade.**

Tentative Course Topics A list of topics to be covered in this class are given below. The list is subject to change, and the starred items may be omitted depending on how much time we have in the course.

Course Topic	**POGIL**	**Reading in Text**
Kinetic molecular theory of gases	G1	24.1
Ideal gases	G2	1.1-1.2
Work	T1	2.1, 2.3
Heat	T2	2.1, 2.4
First Law	T2	2.2
Enthalpy	T3	2.5
Heat capacity	T4	2.4
Kirchoff's Law	T5	2.5, 2.9
Entropy/Second Law	T6, T7	4.1-4.3
Third Law	T8	4.4
Free Energy	T9, T10	4.5
Euler's criterion*	T10A	3.1-3.2, 5.1-5.2
Equilibrium	T11	9.1
Equilibrium constant	T11	9.2
Variation of equil. with temp. and pressure	T12	9.3-9.4
Phase equilibrium	T13	6.4
Vapor pressure	T14	6.2, 6.5
Phase diagrams	T14	6.1-6.3
Ideal solutions	T15	7.3
Chemical potential	T16	7.1
Partial molar quantities	T17	7.1
Colligative properties	T18	7.5
Osmotic pressure*	T19	7.5
Solid-liquid phase equilibrium*	T21	6.6
Solid-liquid phase equilibrium for mixtures	T22	8.6
Liquid-vapor phase equilibrium	T23	8.4
Kinetics*	K1-K7	Ch. 24-25

BIOL/CHEM 361 / Principles of Biochemistry

Dans les champs de l'observation le hasard ne favorise que les esprits préparés. – Louis Pasteur

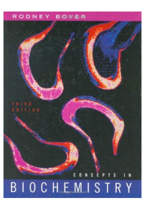
Spring Semester 2011
Natural Science 1 (NS 1)
Tuesdays & Thursdays 12:35 – 1:50 PM (TR 1235–1350h)

Instructor: Michael Van Dyke, Ph.D.
Office: NS 332 Phone: x2286 E-mail: mvandyke@email.wcu.edu
Office Hours: T 1500–1800h and by appointment

I. Rationale/Purpose
CHEM 361 covers the structures and properties of biomacromolecules and the central principles of metabolism. CHEM 361 is cross-listed with BIOL 361. BIOL/CHEM 361 is required for several Biology and Chemistry majors (B.S.) with concentrations in Molecular Biology, Pre-Health Professions, Cell & Molecular Biology, ACS, Biotechnology, Environmental, 4+1, Industrial, Pre-medical, Traditional and a Chemistry B.A. 3h Lecture, 3 credits total. Prerequisites: CHEM 242

II. Course Aims and Objectives:
- Aims: The aims of BIOL/CHEM 361 are to provide students with a deeper understanding of the fundamental principles underlying the chemistry of biological systems, including the identities, synthesis, and functions of important biomolecules (nucleic acids, proteins, carbohydrates, etc). BIOL/CHEM 361 is suitable for both the traditional Biology/Chemistry major and individuals pursuing careers in the allied health sciences and health-related professions (medicine, dentistry, pharmacy, veterinary, etc).
- Specific Learning Objectives: By the end of this course, students are expected to know (1) background information on the environments in which biomolecules interact, *e.g.,* organisms & cell structures, (2) conformational aspects of biomolecules and their dynamic interactions, especially those involving proteins, carbohydrates, and lipids, (3) nucleic acids and their roles in the storage & transfer of biological information, and (4) the basics of bioenergetics and metabolism. Demonstrable knowledge of these will be assessed primarily through quizzes and exams and these serve as the criteria for grading.

III. Course Materials



Course readings:
- Required text: *Concepts in Biochemistry*, 3rd edition,
  author: Rodney Boyer, publisher: John Wiley & Sons, Inc.
  Available for rental at the WCU Bookstore.
- Lectures/supplementary material: these will be made available for upload on Blackboard.

IV. Faculty Expectations of Students/Course Policies

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex. You can also visit the office's website: http://www.wcu.edu/12789.asp

Academic Integrity Policy: Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of the Academic Integrity Policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. While academic in scope, any violation of this policy is by nature, a violation of the Code of Student Conduct and will follow the same conduct process (see ArticleVII.B.1.a.). If the charge occurs close to the end of an academic semester or term or in the event of the reasonable need of either party for additional time to gather information timelines may be extended at the discretion of the Department of Student Community Ethics (DSCE). Violations of the Academic Integrity Policy include:

Cheating - Using or attempting to use unauthorized materials, information, or study aids in any academic exercise.

Fabrication - Creating and/or falsifying information or citation in any academic exercise.

Plagiarism - Representing the words or ideas of someone else as one's own in any academic exercise.

Facilitation - Helping or attempting to help someone to commit a violation of the Academic Integrity Policy in any academic exercise (e.g. allowing another to copy information during an examination)

Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his/her department head, and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction.

Attendance Policy: Attendance is required. Attendance will be taken daily before University Census Day (24Jan11) and periodically thereafter. Your grade may be reduced if you miss more than three classes.

Late and/or Makeup Assignments: Assignments are due when posted, *e.g.,* homework is due at the next class following completion of a chapter in the text. Late assignments are not accepted without instructor approval. There are **no** makeup and/or extra credit assignments.

Expectations for Participation: Students are expected to participate in class, either voluntarily or when called upon. Failure to do so may negatively impact your grade.

Course Evaluations: Students are strongly encouraged to participate in the on-line course evaluation process (CoursEval) at the end of the semester. Doing so will result in an additional 5 points awarded on your Final Exam.

Classroom Behavior: Personal electronic devices beyond simple calculators, including but not limited to laptops, cell phones, iPods, etc., are not permitted in the classroom. Use of these during lectures or exams can have severe consequences, including up to suspension from the class and an automatic F grade for the course.

Inclement Weather Policy: While WCU is primarily a residential campus, many students do commute to class and the weather in western Carolina can be adverse at times. Students are advised to monitor the WCU website http://news-prod.wcu.edu/weather-related-schedule-changes/ for the latest information regarding class cancelation and school closings.

Blackboard Policy: The WCU Blackboard website https://wcu.blackboard.com/ will be the primary means of communicating announcements and all electronic media (*e.g.,* lectures, study guides, test keys, etc).

V. Grading Procedures:
The final grade in CHEM 361 will be determined from a series of six exams (100 points each), 12+ quizzes (100 points total), homework (100 points total), and a final examination (200 points). This is indicated in tabular format below. A running total of classroom points obtained will be provided on Blackboard. The final grade will be determined from the sum of points accumulated, using the table at right. Incremental grades (+/–) **will not** be awarded. A brief description of the grading criteria for each category follows:

	Points possible (% final grade)	Student's score
Exams (6)	6 × 100 pts (60%)	
Quizzes (10)	100 pts (10%)	
Homework	100 pts (10%)	
Final Examination	200 pts (20%)	
	1000 pts (100%)	

Grade	***Total points***
A	900–1000
B	800–899
C	700–799
D	600–699
F	<600
	1000 pts (100%)

Exams: In-class, closed-book exams will be held six times during the semester. Each will emphasize topics covered in the immediately preceding lectures but may also incorporate earlier material, as is deemed necessary. Questions may be multiple-choice or short answer (*e.g.,* biomolecule name, structure, reaction). For each exam, resulting grades may be directly calculated or curved, to be determined by the instructor. Make up exams will not be given except for the most extreme extenuating circumstances (*e.g.,* hospitalization, *force majeure*, etc).

Quizzes: 10+ unannounced, in-class, closed-book quizzes will be given throughout the semester. Each will emphasize topics covered in the immediately preceding lectures but may also incorporate earlier material, as is deemed necessary. Questions typically will be short answer (molecule name, structure, reaction). For each quiz, resulting grades will be directly calculated. Make up quizzes **will not** be given.

Homework: Homework will comprise questions provided at the end of each chapter. All homework corresponding to a particular chapter is due (1) lecture following completion of a chapter in class. Answer keys will be provided at that time; however, **no** homework will be accepted once an answer key has been issued.

Final Exam: An in-class, closed-book, comprehensive final examination will be held at the end of the semester. Questions will be multiple-choice. Final exam grade will be directly calculated and **not** curved. Taking the final exam is mandatory – make up exams will be given if necessary.

Additional Fine Print: while the Instructor is the sole arbitrator of all terms and statements in this syllabus, students are ultimately responsible for knowledge of the aforementioned rules and regulations as well as all class attendance, withdrawal, and drop-add policies and procedures.

VIII. Tentative Course Schedule

Date	Topic	Reading & Homework Assignments	
1 Tues, Jan 11	Syllabus, Biochemistry background	Syllabus, Ch 1	
2 Thurs, Jan 13	Biomolecules & Water	Ch 2	
3 Tues, Jan 18	Overflow		(Ch 1 & 2 homework due)
4 Thurs, Jan 20	Preview & **Exam 1**		
5 Tues, Jan 25	Exam 1 review, Amino acids, peptides, proteins	Ch 3	
6 Thurs, Jan 27	Protein structure & function	Ch 4	
7 Tues, Feb 1	Overflow		(Ch 3 & 4 homework due)
8 Thurs, Feb 3	Preview & **Exam 2**		
9 Tues, Feb 8	Exam 2 review, Enzymology 1	Ch 5	
10 Thurs, Feb 10	Enzymology 2	Ch 6	
11 Tues, Feb 15	Overflow		(Ch 5 & 6 homework due)
12 Thurs, Feb 17	Preview & **Exam 3**		
Tues, Feb 22	Advising Day – No Classes		
13 Thurs, Feb 24	Overflow?		
Tues, Mar 1	Spring Break – No Classes		
Thurs, Mar 3	Spring Break – No Classes		
14 Tues, Mar 8	Exam 3 review, Carbohydrates	Ch 7	
15 Thurs, Mar 10	Lipids	Ch 8	
16 Tues, Mar 15	Membranes	Ch 9	
17 Thurs, Mar 17	Overview		(Ch 7–9 homework due)
18 Tues, Mar 22	Preview & **Exam 4**		
19 Thurs, Mar 24	Exam 4 review, Nucleic acids	Ch 10	
20 Tues, Mar 29	Replication & transcription	Ch 11	
21 Thurs, Mar 31	Translation	Ch 12	
22 Tues, Apr 5	Recombinant DNA	Ch 13	
23 Thurs, Apr 7	Overflow		(Ch 10–13 homework due)
24 Tues, Apr 12	Preview & **Exam 4**		
25 Thurs, Apr 14	Bioenergetics	Ch 14	
26 Tues, Apr 19	Metabolism	Ch 15	
Thurs, Apr 21	Break – No Classes		
27 Tues, Apr 26	Overflow		(Ch 14 & 15 homework due)
28 Thurs, Apr 28	Preview & **Exam 6**		

Advising Day	Tuesday	February 22
Final Semester Examinations	Saturday-Friday	April 30 – May 6
Final Exam in this course		

CHEM 370: Instrumental Analysis I

Department of Chemistry & Physics, Western Carolina University, Cullowhee, NC

Spring 2011
Belk 365
MWF 10:10am – 11:00am

Instructor: Dr. David D. Evanoff, Jr.
Office: NS 325A
Email: devanoff@email.wcu.edu
Phone: x2829
Office Hours: MTW 8:30am – 9:30am
AOL IM: DaveEvanoff (available during office hours)

I. Rationale/Purpose

The purpose of this course is twofold: 1. Develop an understanding of the effects of outside stimuli on a material of interest, and how we, as scientists, can gather useful information from the material's response and 2. Get beyond the 'black box' attitude and come to an understanding of the general principles involved in designing and operating scientific instrumentation. *Prerequisites:* Advanced General Chemistry (CHEM 140), Quantitative Analysis (CHEM 232), and at least Pre-calculus (MATH 146). *Corequisite:* Instrumental Analysis Laboratory.

II. Course Aims and Objectives:

- The basic aim of this course, as is the case of any chemistry course for majors, is to make you a better chemist. In this course, I hope that you will develop some deeper understanding of how instruments work and how they can work for you, i.e. how you can utilize a piece of instrumentation to solve your particular chemistry-related problem. The bottom line is that in practically any chemistry-related profession you will at some point be required to troubleshoot either an instrumental method for a particular experiment or the instrument itself. You won't get very far is all you know is the location of the green 'GO' button.
- Specific Learning Objectives:
  By the end of this course, students will:
  - Demonstrate an understanding of the fundamentals of chemical instrumental analysis and the underlying physical phenomena associated with various measurements
  - Demonstrate developed skills to solve problems in analytical chemistry with an emphasis on instrumental methods
  - Demonstrate an ability to thoroughly analyze instrument-acquired data as well as distinguish between 'good data' and noise/interference
  - Demonstrate the ability to distinguish the value and limitations of instrumental techniques
  - Demonstrate an appreciation of the state-of-the-art of instrumental analysis

III. Course Materials

Course readings:

- Required text: Principles of Instrumental analysis, 5th Ed., by D. A. Skoog et al. (available for rent via bookstore) (available for rent via bookstore)
- Background/supplementary readings: We will also be using additional texts throughout the semester including: Quantitative Chemical Analysis, 7th Ed., by D. C. Harris and Undergraduate Instrumental Analysis, 6th Ed., by J. W. Robinson et al. I will post scanned chapters of these books on WebCat as needed. Also, we will use the online textbook Analytical Chemistry 2.0, which can be found at: http://www.asdlib.org/onlineArticles/ecourseware/Analytical%20Chemistry%202.0/Welcome.html Occasionally, we will also be reading and discussing feature articles from the ACS-published journal *Analytical Chemistry*, which can be accessed through http://pubs.acs.org. Any other supplementary material will be made available through WebCAT.

IV. Course Policies

- Statement on Accommodations for students with disabilities:

  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

- Statement on Academic Integrity (source: WCU Undergraduate Catalog):

  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:

  Cheating - *Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.*

  Fabrication - *Intentional falsification of information or citation in an academic exercise.*

  Plagiarism - *Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.*

  Facilitation of Academic Dishonesty - *Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.*

  I will determine the appropriate first-offense sanction for academic dishonesty within my courses up to and including a final course grade of "F." Multiple offenses will result in a failing course grade. See your undergraduate catalog for more information.

- Attendance Policy

  You are expected to attend and actively participate in each lecture. If you must miss class, please notify me ahead of time and provide documentation as to the reason for your absence upon your return. Except for extraordinary circumstances, **late assignments will not be accepted** and all work should be turned in prior to your absence. I understand that inclement weather may cause absence for commuters and will be accommodating in those cases, although students are expected to make every reasonable effort to attend class.

- Email Communication

  Student catamount email accounts will be used to distribute important materials you need for this course. Email will be sent to your WCU account only. A test email will be sent early in the semester to verify the class roll. Please check your email regularly during the semester.

- Assignments

  Problem sets and reading assignments will be placed in WebCat. Problem sets will be due each Monday via email or WebCat. I strongly encourage teamwork on the homework assignments but equally discourage cloning each other's papers.

- Exams (A celebration of learning)

  Two exams will be given throughout the semester as well as a comprehensive final exam. Tentative exam dates are below. The final will occur on Wednesday May 4th at 8:30am.

Celebration #	Day	Date	Topics
1	Friday	28-Feb	Basics to I.A., sample prep, separations, GC, LC, MS.
2	Wednesday	15-Apr	visible and IR spectroscopy
3	Wednesday	4-May	Cumulative Final – including NMR and complex data analysis

V. Grading Procedures:

Instrumental analysis requires a firm grasp of both the lecture material as well as laboratory material. The class is divided such that 80% of your grade is based on lecture material and 20% on the laboratory. The point system used to calculate a student's earned grade is as follows:

		Total points possible	***% of final grade***
Lecture components:	**Exams**	200	40%
(400 points possible)	**Discussion & Homework**	125	25%
	Comprehensive Final	75	15%
Lab component:	**Laboratory Grade**	100	20%
(100 points possible)			

Letter grades will be determined using the following scale:

A	100% – 93%	C	76% – 73%
A-	92% – 90%	C-	72% – 70%
B+	89% – 87%	D+	69% – 67%
B	86% – 83%	D	66% – 63%
B-	82% – 80%	D-	62% – 60%
C+	79% – 77%	F	59% – 0%

CHEM 371 Dynamics Laboratory
Spring 2011
MW 2:30-5:20, NS 227

Instructor: Dr. Carmen Huffman
Office: NS 212
Contact Info: 227-3682, chuffman@wcu.edu
Office Hours: MW 10:00-12:00 or by appointment

Course Description In this laboratory course, you will be making measurements and treating data obtained in the study of the dynamics (e.g. thermodynamics, kinetics, etc.) of chemical systems. About six hours per week will be spent in the laboratory. This course is worth two credit hours. Prerequisite: CHEM 370. Pre- or co-requisite: CHEM 352.

Learning Objectives By the end of this course, you will

- Be able to convert data into meaningful results and conclusions through calculations.
- assess errors associated with measurements.
- understand the types of measurements used to analyze the *physical* properties of chemical compounds.
- be introduced to the field of chemical modeling through the use of computer software to determine physical properties of chemical systems.
- learn how to write scientifically.

Course Materials Materials for this course are listed below.

- Required text: Atkins, Peter, and Julio de Paula. *Physical Chemistry 7th ed.* New York: W. H. Freeman and Company, 2002. (This text is available for rent from the University Bookstore.)
- Background/supplementary readings: Additional reading material may be assigned throughout the semester. This text will be available online, from the Hunter Library Reserves, as handouts in class or through Blackboard.

Faculty Expectations Expectations of students and course policies are listed below.

- **Accommodations for students with disabilities**: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.

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  - *Cheating* – Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  - *Fabrication* – Intentional falsification of information or citation in an academic exercise.
  - *Plagiarism* – Intentionally or knowingly representing the words or ideas of someone else as ones own in an academic exercise.
  - *Facilitation of Academic Dishonesty* – Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of F in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction.

  Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.

- **Inclement weather policy (as described in the Student Handbook)**: The University does not, as a matter of general practice, close its operations or cancel classes in Cullowhee because of bad weather. Many Western students commute from different distances and directions and weather conditions for those students may vary greatly from conditions on the Cullowhee campus. Students are advised to check road conditions in their areas and determine whether it is reasonable for them to drive to campus. *The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions.* Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions.

  Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises.

Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- **Blackboard**: Blackboard will primarily be used as a source for laboratory handouts, links to electronic resources and other important materials. You will also be able to check your grades for all assignments at any time. Please let me know if encounter difficulty accessing the course materials on Blackboard.
- **Communication**: Your instructor will communicate any important class information to you via email to your WCU account only. A test email will be sent early in the semester to verify the class roll. Please check your email regularly during the semester.
- **Attendance Policy**: This is a hands-on course. Therefore, attendance is mandatory. Any exceptions must be approved by me *in advance*, and work must be made-up at *my* convenience!

Laboratory Considerations This is a laboratory course, so, obviously, there are some special considerations, as follows:

- **Safety**: You should bring safety glasses with you to *every* lab period, even if there is no experiment planned for that day. (Put them in your school bag, and leave them there so you don't forget them!) On some occasions, you may be asked to bring safety goggles instead of safety glasses. Additional safety rules (long pants, closed-toe shoes, etc.) will be discussed in a separate handout.
- **Lab notebook**: You will be required to use a carbon-copy style laboratory notebook for this course. Such notebooks are available at the University Bookstore. If you already have a notebook from another course, you may continue to use that. Details on how to properly keep records in a lab notebook will be forthcoming.

Graded Work Your learning in this course will be evaluated by various graded coursework, listed below.

- **Assignments**: There will be an assignment for every experiment in this course. It may simply be written calculations with typed responses to discussion questions (referred to as a "worksheet") or a full lab report. There will also be one project mid-semester that will require a proposal, report and oral presentation. All assignments will be graded. **No late assignments will be accepted.**

  WCU instructors reserve the right to use plagiarism prevention software (such as SafeAssign) as well as Google, Yahoo, and/or other Internet search engines to determine whether or not student papers have been plagiarized. With plagiarism prevention software, instructors may upload student papers into a searchable database or teach students how to upload their own work as part of the course requirements.

- **Prelabs**: Most experiments will have a prelab assignment. Usually, you will be required to perform initial calculations so that you are prepared when you walk in the door.
- **Notebooks**: Carbon-copy pages of your notebook pages should be turned in with any assignment that's due. These will be graded against a rubric which will be distributed later.

Grading Scheme Final grades will be based on average performance on each of the components listed below. Each component is worth a certain percentage of the final grade as shown below.

Notebooks	10%
Prelab	10%
Worksheet	30%
Lab Report	30%
Project	20%

Tentative Course Schedule Below is a tentative calendar describing the experiments and assignments for the semester. This is still subject to change, and you will be kept apprised as the semester progresses.

Date	Lab Activity	Assignment Due
M 01/10	Classes Canceled	
W 01/12	Introduction & Error Analysis Lecture	
M 01/17	MLK Day – No Classes	
W 01/19	Error Analysis Handout	
M 01/24	Density Lab	Error Analysis Worksheet
W 01/26	Density Calculations	
M 01/31	Heats of Ionic Reactions	
W 02/02	Heats of Ionic Reactions	Density Worksheet
M 02/07	Heats of Ionic Reactions	
W 02/09	Heats of Ionic Reactions	
M 02/14	Heats of Ionic Reactions	
W 02/16	Kinetics vs. Ionic Strength	
M 02/21	Kinetics vs. Ionic Strength	Heats of Ionic Rxns Report 1
W 02/23	Kinetics vs. Ionic Strength	
M 02/28	Spring Break – No Classes	
W 03/02	Spring Break – No Classes	
M 03/07	Binary Solid-Liquid Phase Diagram	Kinetics vs. Ionic Strength Wksht.
W 03/09	Binary Solid-Liquid Phase Diagram	Heats of Ionic Rxns Report 2
M 03/14	Library Day	
W 03/16	Library Day	Binary S-L Phase Diagram Report
M 03/21	Project	Proposal
W 03/23	Project	
M 03/28	Project	
W 03/30	Spectroscopy	
M 04/04	Spectroscopy	
W 04/06	Presentations	Project Report
M 04/11	Spartan	
W 04/13	Spartan	Spectroscopy
M 04/18	Spartan	
W 04/20	Break – No classes	
M 04/25	Spartan Wrap-up	
W 04/27	Lab Clean-up	Spartan Worksheets

Spring 2010

Times to Be Arranged
Natural Sciences Building 217/218/220

Text: Selected readings from the primary literature.

Instructor: William R. Kwochka

Where to find me: NS 225 (office), phone: 7260 (office) 3673 (direct line)
NS 218/220 (research lab), phone: 2330
NS 214 (NMR) phone: 3684
Home phone (my cell): 777-6593 (don't hesitate to call)
E-mail: kwochka@wcu.edu

When to find me: Anytime

Course Description: Undergraduate research (CHEM 380) is the ultimate experience in hands-on learning. This "course" is the logical extension, and an application, of all the lecture and laboratory classes that you have been taking the first few years of college. We will begin by synthesizing simple organic molecules that do not require very delicate procedures and gradually move toward more complicated reactions that require inert atmospheres and good technical skill. This course will emphasize the techniques involved in synthetic chemistry such as purification of starting materials, running the reaction, workup of the reaction, purification of the reaction product and, finally, characterization of that material primarily via ^{1}H, ^{13}C, and COSY NMR. Additionally, we will begin to address some ethical issues surrounding science with examples culled from your experience in the lab.

Expectations: You need to treat this course as you do any other; that is you need to spend a predictable and consistent amount of time in the lab. However, you also need to be flexible with those hours. Some days you may only need to spend an hour or two setting up a reaction, whereas at other times you may need to all day doing purification. Perhaps the most important aspect of the undergraduate research experience that I would like to stress, other than having fun, is that safety is should be your ultimate concern. EVERYONE is required to wear safety glasses while in the lab and gloves shall be worn at all times. Lab coats are also a good idea because they protect clothing and skin. *In that vein, I would like to stress the need for a clean and orderly lab; accidents are less likely to occur and glassware less likely to be broken when the dishes are washed and put away promptly.*

Evaluation: Your final grade (using the +/- grade system) in this research course is based upon your notebook (which I will check periodically), the progress of your work, biweekly experimental write-ups, and a monthly progress report.

Grading Policy: There will be no exams in this course. The final grade will be based upon a report (either a formal lab write-up or a worksheet) of each of the synthetic schemes along with, at times, your lab notebook. The grade scheme for the course is as follows; **A** = 100-93, **A-** = 93-90, **B+** = 90-87, **B** = 87- 83, **B-** = 83-80, **C+** = 80-77, **C** = 77-73, **C-** = 73-70, **D+** = 70-67, **D** = 67-63, **D-** = 63-60, **F** = 60 and below.

Each report will be due approximately 1-2 weeks after the experiment is completed. I will provide more information about the specific requirements for each experiment at the appropriate time. Late reports will be penalized **five percent per day**, excluding weekends. For the first two formal write-ups (the ethanol and ester labs) you will be given the opportunity to revise your report for a better grade. *All rewrites must be accompanied by the original draft and grade sheet.* Rewrites that are missing the original draft and grade sheet will be considered late and points deducted accordingly.

The notebook, <u>which remains in the lab with me at the end of the semester</u>, should contain enough detail so that someone else reading it would be able to repeat the experiment and get the same results. **Please leave your notebook in the lab at all times**. We will consult weekly on the progress of the work to determine whether any course corrections need to be made. If the work merits, we may submit an abstract for presenting a paper at Western's Undergraduate Research Conference, and perhaps an outside research conference. One week prior to the end of each semester (the week before finals), you will end lab work and focus on cleaning up your work area, cataloging products synthesized, and carefully organizing spectral data. At the end of the year you will be responsible for handing in the following:

- Synthesized material(s) in a properly labeled container.
- All pertinent spectral data (MS, IR, GC, ^{1}H NMR, and ^{13}C NMR) in a loose-leaf binder.
- Completed notebook.
- Write-up of the year's work. This report is to be in the *J. Org. Chem.* format. An example of a published manuscript is attached. In addition, an example of the type of the experimental that I expect is also attached. Please do not omit any detail and above all report all results accurately and honestly.

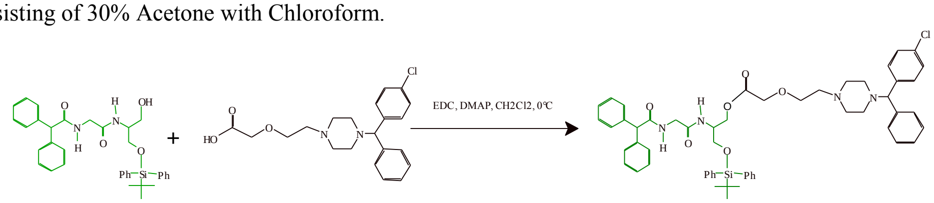
Example of the Monthly Progress Report

The Monthly Progress for November 2007

Januka Budhathoki

1. Coupling of auxiliary thread with Cetirizine and purification of the product

Cetirizine hydrochloride was coupled with auxiliary thread using EDCI and DMAP at low temperature. The progress of the reaction was monitored by TLC. The product was purified by column chromatography using binary solvent system consisting of 30% Acetone with Chloroform.

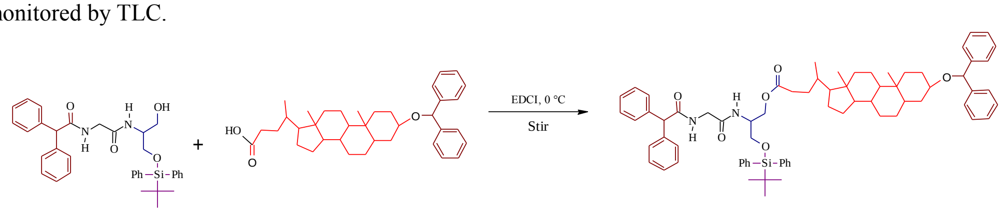


%yield = 88 %

^{1}H NMR, COSY and ^{13}C NMR spectra of the compound was taken and showed that product was formed.

2. Coupling of auxiliary thread with Steroid

Steroid was coupled with auxiliary thread using EDCI and DMAP at low temperature. The progress of the reaction was monitored by TLC.



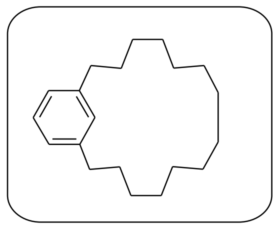
Coupling yielded the product in 88% yield.

^{1}H NMR, COSY and ^{13}C NMR spectra of the compound was taken and showed that product was formed.

These *progress reports*, which should be about one page in length (two at the most), will be word processed with chemical structures drawn using **ChemSketch** and be due on the last Friday of each month.

Example of the biweekly Experimental Write-up

[14]-Metacyclophane



Experimental A 300 mL round bottom flask (RBF) was dried and flushed with Ar. First, 0.5 M 9-BBN in THF (17mL, 8.49 mmol, 2.2 equ) was added via syringe under inert atmosphere. Then, 1,13-tetradecadiene (0.884 mL, 3.86 mmol, 1 equ) was added and the solution was stirred under inert atmosphere at room temperature for 8 hrs. A separate 300 mL RBF was dried and flushed with Ar. 150 mL of THF was added to the RBF. NaOH (1.197g, 29.9 mmol, 7.75 equ), $Pd(PPh_3)_4$ catalyst (0.141g, 0.193 mmol, 0.05 equ), and 1,3-dibromobenzene (0.467 mL, 3.86 mmol, 1 equ) were added in that order and the reaction mixture was stirred at room temperature under an inert atmosphere. The previous reaction mixture was cannulated into this RBF. When the first few drops are added, the solution turns from a light yellow (from dissolved catalyst) to a light brown color and immediately begins to lighten back until its near-original color is observed. A reflux condenser was immediately attached and the reaction mixture is heated to reflux under Ar. As the mixture is heated, it slowly becomes cloudy. The mixture is allowed to reflux overnight. The reaction mixture is allowed to cool to room temperature and then is cooled in an ice bath. To consume any unreacted 9-BBN, 30% H_2O_2 was added drop wise until bubbling was to a minimum (about 20 mL). About 200 mL of hexanes was added. The reaction mixture was washed with 2x150 mL of 1N HCl and 1x100 mL of sat. $NaHCO_3$, and the organic layer was allowed to dry over sodium sulfate overnight. The solvent was removed via rotovap. This leaves a dark green solid. The crude product was filtered through a plug of silica gel with pure hexanes. Solvent was removed via rotovap and the product is a yellow oil with some signs of crystal growth. The yellow oil was run through a flash column (12” of silica gel, 2” diameter, 100% hexanes). A 100 mL portion was collected, and then 40 20 mL portions were collected. In test tubes 4-10, 161 mg (6.5%) of colorless oil was collected. ^1H NMR (300 MHz, Acetone-d) δ 7.17 (t, 1H), 6.99 (d, 3H), 2.60 (t, 4H) 1.62 (m, 4H) 1.28 (m, 22H). Elem. anal. Theory: C-88.16% H-11.84%; Found: C-88.02% H-11.76%.

Syllabus - CHEM 421 (Advanced Inorganic Chemistry)
Spring 2012

Course Information

Lecture Meeting Time: Mon, Wed, Fri at 12:20 – 1:10 pm Location: NS 308

Lecture Instructor: Dr. Channa R. De Silva Office: NS 213 Phone: 828-227-3637

Email: mhdesilva@wcu.edu

Office Hours: Mon, Wed, Fri (1:15 – 2:30 pm) or by appointment

Text: Inorganic Chemistry, Principles of Structure and Reactivity by Huheey, Keiter, and Keiter, 4th edition.

Supplementary Reading: Any Inorganic Chemistry text book and Inorganic Chemistry journal articles. Relevant lecture materials, homework assignments, and quizzes will be posted on blackboard.

Course Description and Purpose

This course is an introduction to advanced inorganic chemistry concepts. The course materials are designed to prepare students for higher studies and chemical industry and to develop their knowledge on modern interdisciplinary areas of inorganic chemistry. Course materials will include a comprehensive examination of the physical and chemical properties of inorganic materials with an emphasis on chemical reactivity and structure, spectroscopy, catalysis, nanotechnology, bioinorganic chemistry.

Course Objectives

Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an excitement to learn. You will participate in all class activities by: reading assigned material; doing homework and presentations; participating in classroom discussions; and contributing in other creative ways for the benefit of you and the class. Specific learning objectives include (1) understanding of advanced inorganic chemistry concepts (2) development of inorganic chemistry related problem solving skills, (3) development of scientific reasoning skills, and (4) applications to the fields of materials science, nanotechnology, and bioinorganic chemistry.

Class Attendance

Attendance is required. Your grade may be reduced if you miss more than two classes. Cell phones must be turned off during lecture hours except emergency situations. Violations may result in loss of credit for the course. You may also be asked to leave the lecture hall. Web browsing and other computer-related activities are not allowed during the lecture hours.

Communication

Your instructor will communicate any important class information to you via email. Email will be sent to your WCU account. You are responsible for keeping this account open. If you use another email account, it is your responsibility to forward email from your WCU account to the one you use more frequently. **Email messages will not be sent directly to non-university accounts.** Please check your email regularly during the semester.

Exams

Three hourly exams will be given in addition to the final exam. There will be no make-up exams. All exams will be given in the room where your lecture normally meets. Tentative exam dates are February 8th, March 14th, and April 18th, 2012. Final exam will be held at 3.00-5.30 pm on the 1st of May, 2012 (please refer to the registrar's website).

Homework, Reading assignments, Participation, and Quizzes

Homework will be assigned, collected, and graded. You are expected to participate in class discussions and complete reading assignments. You may be assigned topics for class presentations. <u>Late homework and other late assignments will NOT be accepted</u>.

Grade Determination

Assignment	Points
Exam 1	100
Exam 2	100
Exam 3	100
Final Exam	200
Homework and Quizzes	200
Class Participation	50
TOTAL	750

Grading

Final grades will be based on percentage of the total points from three hourly exams, the final exam, and other assignments as shown above. The grade scheme is as follows; A = 100-93, A- = 93-90, B+ = 90-87, B = 87- 83, B- = 83-80, C+ = 80-77, C = 77-73, C- = 73-70, D+ = 70-67, D = 67-63, D- = 63-60, F = 60 and below.

Outline of the Topics

- Symmetry and Group Theory
- Coordination Chemistry (structure, reactivity, bonding, spectra, and magnetism)
- Organometallic Chemistry
- Inorganic Metal Clusters
- Reactions and Catalysis of Organometallic Complexes
- Inorganic Chemistry of Biological Systems
- Inorganic Complexes in Medicinal Chemistry
- Inorganic Chemistry and Nanotechnology
- Lanthanide Chemistry

Academic Honesty Policy

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a) **Cheating—**intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
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Good Luck and Enjoy Inorganic Chemistry ☺

CHEM 435 Instrumental Analysis II / Advanced Instr. Lab - Fall 2011
R 2-7pm NS 208

Instructor: Dr. Arthur Salido
Office: ST 416
Contact Info: x2587, email through Blackboard
Office Hours: Monday 2-4 or by appointment

I. Course Description

Aims: This course covers the theories and practices related to contemporary analytical instrumentation. Some essential skills that are required include the following: college-level reading proficiency, mastery of algebraic operations, and a very high capacity to grasp, analyze, and manipulate abstract concepts.

II. Specific Learning Objectives

Upon completion of this course, a student will be able to demonstrate competence in these areas:

a. Understanding contemporary instruments and related methods
b. Solving chemical problems
c. Understanding and applying chemical principles (demonstrated by test, quiz, lab and homework performance)
d. Making accurate physical and chemical measurements in laboratory
e. Using MS Excel to investigate complex equilibria, solve problems, plot, and manipulate recorded data**III.**

III. Course Materials

a. Rental textbook "PRINCIPAL OF INSTRUMENTAL ANALYSIS, 6TH EDN." Skoog
b. Scientific Calculator
c. MS Office
d. Goggles or Glasses
e. Gloves
f. Laboratory Notebook

IV. Faculty Expectations of Students and Course Policies

- <u>Accommodations for students with disabilities:</u>
  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.
- <u>Academic Honesty Policy (as described in the Student Handbook):</u>
  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  a. *Cheating*—Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  b. *Fabrication*—Intentional falsification of information or citation in an academic exercise.
  c. *Plagiarism*—Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
  d. *Facilitation of Academic Dishonesty*—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction.
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Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- Blackboard:
  Blackboard, an online course management system, will be used as a source for class handouts, review material, and quizzes. You will also be able to check your grades for all assignments at any time.
  To access Blackboard, log in to MyCat using your 92-number and your PIN. Click the Blackboard link on the left side of the screen or, under the Personal Services tab, select Student Main Menu and follow the Blackboard link. You will see all of your courses at that time. Select CHEM 139 to access information for this course. Please let your instructor know ASAP if you have any trouble accessing the course.
- Communication:
  Your instructor will communicate any important class information to you via Blackboard and your Catamount e-mail address. A test email will be sent early in the semester to verify the class roll. Please check your WebCat and Catamount e-mail regularly during the semester. (Email can not be forwarded to a personal email account.)
- Cell Phones and Laptops:
  Please shut off cell phones. You are not allowed to use cell phones and laptops in class. If you need a laptop, you must get authorization from disability services, which will make justification for your need.
- Class Conduct:
  You are expected to act professionally, respectful and courteous toward others. It is your job to learn and my job to help you. Any activity that prevents this from happening will be remedied if possible.
- Attendance Policy:
  The more classes you attend, the better your grade. Students who miss class perform poorly and often must withdraw from the course. Attendance will be checked daily. It counts 4% of your final grade.
- Quizzes and In-Class Assignments:
  Quizzes will be assigned regularly in class and can not be made-up if missed. There may also be non-graded, in-class assignments (worksheets). You are expected to work on these assignments even though they are not graded because they are intended to help reinforce material covered in class. In some cases you may be allowed to work in groups or take the assignment home for completion.
- Tests:
  Three 50-minute tests will be given in class (see schedule below). If you miss a test, you will be given an alternate version (only once this semester). If you miss a second time, you will receive a zero for that test grade.
- Final Exam:
  The final exam is scheduled by the University (see schedule below). The final exam is cumulative.

V. Grading Procedures:
Final grades will be based on average performance on each of the components listed below. Each component is worth a certain percentage of the final grade as shown.

	Percentage of Final Grade
Attendance	4%
Quizzes / Misc. Assignments / Homework	10%
Tests	33%
Final Exam	20%
Laboratory	33%

Percentages will be converted to letter grades as follows:

Numerical Percentage	**Letter Grade**
>96%	A+

93% - 96%	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	C
70% - 72%	C-
67% - 69%	D+
63% -66%	D
60% - 62%	D-
<60%	F

VI. Tentative Course Schedule
This chart is the Test schedule. It is accurate on the dates BUT tentative on content. Extenuating circumstances could cause us to lag or exceed the schedule.

Test 1	Thursday September 29
Test 2	Thursday November 3
Test 3	Thursday Dec 1
Project Presentations	Thursday December 8
Final Exam	Monday December 12 (12-2:30)

VII. Laboratory: Projects

Goal: Students will learn one or more instruments in-depth as they research and perform experiments related to one project idea throughout the semester. Students will work in groups (≤ 5 people) or alone. Grad students should limit group sizes to 2 people.

Time: You must spend at least 3 hrs per week working on your project. Most of the work will occur outside of regular class time. You will record your weekly activities in a lab notebook, that I will check regularly.

Strategy: Students who are already engaged in CHM 380 or CHM 698 research, will work on that project idea with some modification for this course. Students who are not already engaged in a project will either develop a new research project or choose one offered by Dr. Salido.

Project Ideas:
Can be anything as long as we have the supplies and instruments.
Modification of existing research: Undergraduate students who are already engaged in CHM 380 will focus on the instrumentation used in your research. For example, you may be involved in research where you synthesize something but characterize your compounds by NMR, or IR. For this course, you would focus on the NMR or IR aspects of your research. You could investigate questions like: what NMR or IR parameters could be adjusted to improve my signal? Could I use another technique like GCMS or LCMS to characterize my compounds? Another example: If you are using chromatography to separate compounds, you could design a project where you investigate how different solvent conditions (concentrations, pH, buffers), columns, flow rates, etc. affect your results. Before starting your project for this course, you should consult with your research advisor and with Dr. Salido to help clarify your project direction.

Project schedule and activities:

9/1 A group representative (GR) will email me the names of the group's members. The GR will represent the group but is not responsible for managing each assignment. The group should assign tasks, for example: GR is the spokesperson who hands assignments in, Secretary assembles the group's work and prepares if for submission, Instrument Expert, Method Expert….

9/8 GR must submit **3 topic ideas**. If the group is sure about the project topic at this point, then one topic is fine.

9/15 Each GR will hand in a **project title and one-paragraph overview** of the project that describes the **purpose** of the project, the **instrumental / experimental methods** to be used (as specific as possible – this may change during the semester), and **expected outcome** (s). If you are modifying existing chem 380 work, the overview must include your research advisor's signature which will indicate that you have discussed this project with him/her and that he/she thinks this is a suitable project topic. Ask your advisor if you can perform the experiments at a suitable time for them.

9/22 **Literature**: Each GR will give me **2-3 peer-reviewed journal articles** that are directly-relevant to your project, including a **one-paragraph summary of each article.**

9/29 **Methodology**: Each GR must hand in a fairly detailed description of their project procedure. Students should describe what instrument (s) will be used, what reagents / accessories / consumables will be needed, and when/where the experiments will occur.

10/6 **Revisions and Grade for Part 1** (everything so far): If the project needs to be revised, the GR must submit changes in writing, including reasons. For example, if you found a new article, submit it to me.
Grade for Part 1: Each group member will comment on the work his/her peers are doing. This will be done anonymously. I don't want grades, just comments. I have been observing you as well so I will have my own grade to give.

Week of 10/20 **Start Experiments** (make sure I know, when/where you are doing experiments). I will need to meet with each group to develop a weekly schedule when I can meet with you and help.

10/27 – 12/1 **Activities Reports**: At the beginning of each lab, students should turn in a one or two paragraph summary of all project-related activities that they have been involved in since the beginning of the previous lab meeting. The report should include descriptions of experiments performed, any literature searches / reading, any data acquired, and any conclusions made. EVERYTHING (thoughts, data, conclusions, calculations) should be neatly written in their lab notebook and turned in.

12/8 Students will make a PowerPoint presentation of their project. Details will be given later. Final report guidelines are listed below.

Here are some guidelines to help you assemble your final report.

- 12 pt font, times new roman, 1in margins, double-spaced, ACS style references, page numbers, printed and handed in (in my mailbox, in person, or under my office door) by Wednesday Dec 7, 5pm.
- Turn in your lab notebook with your report.
- Abstract: A 5-10 sentence summary of the key information that will be found in your report.
- Research basis: Why are you doing this project? What problem are you trying to solve? You can include information from your research advisor.
- Background: Shed some light on how the problem is currently solved? What issues have to be taken into account? You should include citations here. Use the ACS format for bibliographies/references.
- Experimental: What you did, including an explicit-as-possible procedure. Include all reagents/instruments/methods used.
- Data/Results: both negative and positive
- Conclusions: How did your experiments get you closer to a solution? What were you able to conclude with the experiments that you did?
- Future Direction: If you weren't so lucky in your experiments, what future experiments should be performed to address the problem? What ideas do you have about the problem?
- Your thoughts: What did you think of this open-ended project? Did you like it? Did you or I overreach? How can it be made better? Would you prefer traditional lab experiments? Did you have enough time? Did you need more direction or accountability or did you prefer freedom to do what you wanted?
- This should be a 10pg or more manifesto (included in the 10 pages are all of the above sections plus figures/tables/references, so it should not be too bad)!

CHEM 453 Physical Chemistry II
Fall 2011
MWF 11:15-12:05, NS 208

Instructor: Dr. Carmen Huffman
Office: NS 212
Contact Info: 227-3682, chuffman@wcu.edu
Office Hours: MWF 9:30-11:00 or by appointment

Course Description In this course, you will study quantum mechanics, atomic and molecular spectroscopies and applications of thermodynamics. Three hours per week will be spent in lecture. This course is worth three credit hours. Prerequisites: CHEM 352, MATH 255, and PHYS 230. (Calculus is an important component for this course. If you have concerns about your math background, please see me right away.)

Learning Objectives By the end of this course, students will

- Recognize the differences between classical and quantum mechanics.
- Be able to use wavefunctions to describe one-, two-, and three-dimensional translational, vibrational, and rotational motion and energy.
- Be able to apply the laws of quantum mechanics to monatomic, diatomic, and polyatomic systems to predict or approximate energies.
- Be able to determine if spectroscopic transitions are allowed or forbidden and calculate their corresponding energies.
- Understand the principles governing pure rotational, vibrational, and electronic spectroscopies (including fluorescence and phosphorescence).

Students may also

- Be able to describe two bonding theories (valence bond and molecular orbital) and use those theories to predict molecular geometry and bond strength.
- Understand the origins of rate laws, use them to predict time dependent concentrations of products and reactants, and use them to propose reaction mechanisms.

Course Materials Materials for this course are listed below.

- Required text: Atkins, Peter, and Julio de Paula. *Physical Chemistry 7th ed.* New York: W. H. Freeman and Company, 2002. (This text is available for rent from the University Bookstore.)
- POGIL handouts, distributed in class and available via Blackboard.

Faculty Expectations Expectations of students and course policies are listed below.

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- **Electronic devices**: The use of electronic devices during class can be distracting to your instructor and your classmates. Students who are texting, listening to music, or using a computer in class will be warned to stop unless a special exception has been made for that class period. Students who continue to text, play music, or use a computer will be asked to leave. Having any electronic devices visible during in-class quizzes or tests is strictly forbidden because they can be used for cheating.
- **Blackboard**: Blackboard will primarily be used as a source for handouts, study guides, old exams, and other important materials you can use to prepare for exams. You will also be able to check your grades for all assignments at any time. Please let the instructor know if you encounter difficulty accessing the course materials on Blackboard.
- **Communication**: Your instructor will communicate any important class information to you via email to your WCU account only. A test email will be sent early in the semester to verify the class roll. Please check your email regularly during the semester.
- **Attendance Policy**: Attendance to class is mandatory and will be monitored via daily quizzes. The two lowest quiz grades will be dropped to account for excused absences. As a courtesy, please notify your instructor *as soon as possible* if you know you will be absent or have missed a class. This is especially important if you know you will be absent for an extended period of time due to illness or other unusual circumstances.

POGIL Process-oriented guided-inquiry learning (POGIL) will be used to teach this course. This is a teaching strategy where students work in learning teams to explore and identify concepts and apply them to solving problems. Some students may not be familiar with this method, and may find difficult in the beginning. However, research has shown that this method is powerful in helping students understand and retain chemical concepts, and I believe (or at least hope) that, at the conclusion of this course, students will wish every course was taught in this manner. An additional handout with more details about this method will be provided.

Graded Work Your learning in this course will be evaluated by various graded coursework, listed below.

- **Homework**: Assignments will be given regularly in this course, as the only way to learn the material is to immerse yourself in it. All assignments must be turned in at *the beginning* of the class period in which it's due. A few problems from the assignment will be graded (at random). Graded assignments will be passed back to you.
- **Quizzes**: Quizzes will be given daily in this course. Topics will be based on the previous class day's POGIL exercise or lecture material.
- **Exams**: There will be four in-class exams. All exams are mandatory, but the lowest exam grade is dropped. Tentative exam dates: W 09/14, F 10/07, M 11/07, and M 12/05.
- **Final exam**: The final exam is scheduled for Monday, Dec 12^{th}, 3:00-5:30. The exam will be cumulative.

Grade Determination A student's scores on homework, quizzes, exams, and the final exam will be used to determine his or her final grade for the course. (Any graded POGIL activities will fall under the "homework" category.) These scores will be weighted as defined in the table below.

Graded work	**Weight**
Homework	20%
Quizzes	10%
Exams	45%
Final Exam	25%

Tentative Course Topics A list of topics to be covered in this class are given on the following page. The list is subject to change.

Course Topic	Reading in Text
Introduction to Quantum Mechanics	
Origins of quantum mechanics, quantum chemical principles	11.1-11.2
Wavefunctions, mathematics for quantum mechanics	11.3-11.6
Types of motion and energy	
Translational motion: particle in a box	12.1
Translational motion: particle in a 2-D/3-D box	12.2
Vibrational motion: harmonic oscillator	12.4-12.5
Rotational motion: angular momentum, moment of inertia and spherical polar coordinates	12.6
Rotational motion: particle on a ring	12.6
Rotational motion: particle on a sphere	12.7
Rotational motion: spin	12.8
Atomic structure	
Hydrogenic atoms	13.1
Orbitals, quantum numbers, electron configurations	13.2, 13.4
Spin-orbit coupling, term symbols	13.9
Selection rules	13.3, 13.9
Molecular structure	
Born-Oppenheimer approximation	14
Valence bond theory	14.1
Homonuclear diatomics	14.2
Polyatomic molecules	14.3
Molecular orbital theory	14.4
Homonuclear diatomics (again)	14.5
Heteronuclear diatomics	14.6
Variational theory	14.7
Hückel theory	14.8
Spectroscopy	
Types of spectroscopy and electromagnetic radiation	16.1
Spectral line width and intensities	16.2-16.3
Atomic spectroscopy: Balmer series	13.1
Rotational spectroscopy: Microwave	16.4-16.6
Rotational Raman spectroscopy	16.7
Vibrational spectroscopy: Infrared	16.9-16.11
Rotational-vibrational spectroscopy: Infrared	16.12
Vibrational Raman spectroscopy	16.13
Vibrational spectroscopy of polyatomics	16.14-16.16
Electronic spectroscopy: Franck-Condon priniciple	17.1
Electronic spectroscopy: UV/vis, fluorescence & phosphorescence	17.3

Spring 2012

Tuesday and Thursday, 11:00 AM to 1:50 PM
Stillwell 419 *and* Natural Sciences 217

Course Information:

For the 1st half of the semester from 1/10 to 2/28
Dr. Channa R. De Silva
Office: NSB 213
Phone: 3637
E-mail: mhdesilva@email.wcu.edu
Office hours: In lab

For the 2nd half of the semester from 3/6 to 4/26
Dr. William R. Kwochka
Office: NSB 225
Phone: 3673
E-mail: kwochka@wcu.edu
Office hours: In lab

Text: Selected reading from the literature.

Course Description and Purpose: This course is designed to be an extension of the sophomore organic chemistry lab (CHEM 272) and serve as an introduction to advanced inorganic and organic synthesis. We will begin the semester by synthesizing simple molecules and complexes that do not require very delicate procedures and gradually move toward more complicated reactions that require inert atmospheres and good technical skill. This course will emphasize the techniques involved in synthetic chemistry such as purification of starting materials, running the reaction, workup of the reaction, purification of the reaction product, and, finally, characterization of the materials via ^{1}H, ^{13}C NMR (both in one and two dimensions), and spectroscopic techniques such as FT-IR, UV-Visible, and fluorescence.

In addition, we will place a great deal of emphasis on searching the scientific literature (both electronic and bound periodicals) and on scientific writing with specific journals like the *Journal of Organic Chemistry* and *Inorganic Chemistry* in mind. Some experiments will require short setup times with little time actually spent performing the reaction; others may need constant attention. You should plan to use this “down” time to work on (in the lab or in the library) future experiments. Be prepared to put in some odd hours.

Course Objectives: Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an excitement to learn. You will participate in all laboratory activities by: reading assigned material, participating in classroom discussions, performing experiments in the laboratory, and contributing in other creative ways for the benefit of you and the class. Specific learning objectives include (1) development of advanced inorganic and organic synthetic chemistry skills and materials characterization techniques, (2) development of synthetic chemistry related problem solving skills, (3) development of scientific reasoning skills, and (4) improvement of independent research skills in chemical sciences.

Course Outline: The semester will be divided into two parts: the first ½ of the semester (De Silva, 14 class meetings) will be spent on synthetic **inorganic** chemical reactions and techniques and the second ½ of the semester (Kwochka, 14 class meetings) will involve synthetic **organic** chemical reactions and their corresponding techniques. Midterm break conveniently separates the two halves of the semester. The following is a **tentative** schedule for labs during the semester:

De Silva: from 1/10 to 2/28

Synthesis and Characterization of Transition Metal Acetylacetonate Complexes (100 points)	Handouts and references to be provided
Determination of Crystal field Splitting Energy of Transition Metal Complexes (100 points)	Handouts and references to be provided
Investigation of Molecular Fluxionality of an Allylpalladium Complex (100 points)	Handouts and references to be provided
Luminescence Property Investigation of Europium Metal Complexes (100 points)	Handouts and references to be provided

Introduction to Nanomaterials: Synthesis of Luminescence Nanoparticles (could be extended to a project proposal) (50 points)	Handouts and references to be provided

Kwochka: from 3/6 to 4/26

General topics for experiments in the lab	**For information about each of these topics, please see the following websites. I encourage you to check out the "biographical" and "Nobel lecture" sections for each laureate, as well some of the other aspects of this site. Specific experimental procedures will be made available by midterm break**
Discovery and development of the diene synthesis: **Diels-Alder** Reaction *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1950/#
Palladium-catalyzed cross couplings in organic synthesis: **Suzuki-Miyaura** Coupling *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2010/suzuki.html
Development of the metathesis method in organic synthesis: **Grubbs** Ring Closing Metathesis *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2005/grubbs.html
Development and use of molecules with structure-specific interactions of high selectivity: **Pedersen** Crown Ether Synthesis *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1987/pedersen.html

Grading Policy: There will be no exams in this course. The final grade will be based upon a report (either a formal lab write-up or a worksheet) of each of the synthetic schemes along with, at times, your lab notebook. The grade scheme is as follows; **A** = 100-93, **A-** = 93-90, **B+** = 90-87, **B** = 87- 83, **B-** = 83-80, **C+** = 80-77, **C** = 77-73, **C-** = 73-70, **D+** = 70-67, **D** = 67-63, **D-** = 63-60, **F** = 60 and below.

Class Attendance: Attendance is required. Your grade may be reduced if you miss more than two classes. Cell phones must be turned off during lecture hours except emergency situations. Violations may result in loss of credit for the course. You may also be asked to leave the laboratory.

Communication: Your instructors will communicate any important class information to you during the laboratory meetings or via email and blackboard, email will be sent to your WCU account. You are responsible for keeping this account open. If you use another email account, it is your responsibility to forward email from your WCU account to the one you use more frequently. Please check your email regularly during the semester.

Laboratory reports, Homework, Reading assignments, and Quizzes: Each report will be due approximately 1-2 weeks after the experiment is completed. More information about the specific requirements for each experiment will be provided at the appropriate time. We will be doing a writing experiment this semester by using a grading rubric. The intention is to provide some clarity about the expectations for writing assignments. *Late laboratory assignments will not be accepted.* The first formal write-up you will be given the opportunity to revise your report for a better grade. *All rewrites must be accompanied by the original draft and grade sheet.* A rewrite that is missing the original draft and grading rubric sheet will be considered late and points deducted accordingly.

Homework or quizzes may be assigned, collected, and graded. You are expected to participate in class discussions and complete reading assignments.

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There will be no lab meetings on **February 21** (Advising Day), **March 1** (Midterm Break), or **April 3, 5** (Spring Break).

*We have only **28** meetings this semester, so let's get busy!*

Revised: WRK, 1/6/2012

CHEM 495 Chemistry Seminar - Fall 2011
F 2:30-4:30 NS 208

Instructor: Dr. Arthur Salido
Office: ST 416
Contact Info: x2587, email through Blackboard
Office Hours: Monday 2-4 or by appointment

I. Course Description

The primary goals of this course are (1) to improve your oral and written communication skills, (2) to discuss topics which are relevant to the chemical profession but are outside the scope of conventional courses, and (3) to assist your progress towards your degree in chemistry. These goals are addressed by the following:

- Attendance!
- Attendance at seminars presented by other students and visiting speakers
- Presentations

II. Learning Objectives

By the end of this course, students will be able to:

- Improve your speaking skills
- Improve your career development skills
- Understanding chemical literature.

III. Course Materials

- All relevant materials will be posted in Blackboard

IV. Faculty Expectations of Students and Course Policies

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  b. *Fabrication*—Intentional falsification of information or citation in an academic exercise.
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  d. *Facilitation of Academic Dishonesty*—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction. *Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.*
- Inclement weather policy (as described in the Student Handbook) :
  The University does not, as a matter of general practice, close its operations or cancel classes in Cullowhee because of bad weather. Many Western students commute from different distances and directions and weather conditions for those students may vary greatly from conditions on the Cullowhee

campus. Students are advised to check road conditions in their areas and determine whether it is reasonable for them to drive to campus. The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions. Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions. Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- Blackboard:
  Blackboard, an online course management system, will be used as a source for class handouts, review material, and quizzes. You will also be able to check your grades for all assignments at any time.
  To access Blackboard, log in to MyCat using your 92-number and your PIN. Click the Blackboard link on the left side of the screen or, under the Personal Services tab, select Student Main Menu and follow the Blackboard link. You will see all of your courses at that time. Select CHEM 139 to access information for this course. Please let your instructor know ASAP if you have any trouble accessing the course.
- Communication:
  Your instructor will communicate any important class information to you via Blackboard and your Catamount e-mail address. A test email will be sent early in the semester to verify the class roll. Please check your WebCat and Catamount e-mail regularly during the semester. (Email can not be forwarded to a personal email account.)
- Cell Phones and Laptops:
  Please shut off cell phones. You are not allowed to use cell phones and laptops in class. If you need a laptop, you must get authorization from disability services, which will make justification for your need.
- Class Conduct:
  Large classes can sometimes get unwieldy. You are expected to act professionally, respectful and courteous toward others. It is your job to learn and my job to help you. Any activity that prevents this from happening will be remedied if possible. Repeat offenders will be asked to withdraw from the course.
- Attendance Policy:
  Attendance is mandatory. You can have 1 excused absence. Every additional absence (whether excused or not) will reduce your final grade by one letter. Every assignment that you miss may be made up and if it can not, you will receive a zero for that assignment.
- Quizzes and In-Class Assignments:
  Quizzes will be assigned regularly in Blackboard and can not be made-up if missed. There may also be non-graded, in-class assignments (worksheets). You are expected to work on these assignments even though they are not graded because they are intended to help reinforce material covered in class. In some cases you may be allowed to work in groups or take the assignment home for completion.

V. Grading Procedures:
Your grade is based on the assignments that you will complete. Absences will negatively impact your grade.

Percentages will be converted to letter grades as follows:

Numerical Percentage	Letter Grade
>96%	A+
93% - 96%	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	C
70% - 72%	C-

67% - 69%	D+
63% -66%	D
60% - 62%	D-
<60%	F

VIII. Tentative Course Schedule
Course Material (*subject to change*):

Date:	Assignments
8/26	Pick Three Job Advertisements and answer: 1. Who is the employer? 2. What does the company do? 3. What job are they advertising? 4. What would your tasks be? 5. What are their required qualifications (education, experience, background, etc.) 6. One paragraph explanation of why you would want the job (assuming salary is suitable) and why you are qualified
9/2	Choose the job that is most appealing and write a cover letter. Send me an electronic copy by **12noon 9/7**. You must look up info about how to write a cover letter, bring your info with you to class (copies for me too), and we will review the cover letters (anonymously) in class.
9/9	1. Edit and improve your cover letter, making sure to make all proposed changes. Hand in on 9/16. 2. Prepare a resume that is **targeted** for the job you chose. Look up info about how to prepare a resume (hand in copies, at least representative info, for me). Send me an electronic copy of your resume by **12noon 9/14** so we can review in class.
9/16	1. Edit and improve your resume, making sure to make all proposed changes. Hand in on 9/23 2. Pick 5 questions that you "know" you will be asked at the interview for the job you chose. Write one paragraph responses for each question. Send an ecopy by **12noon 9/21**.
9/23	Take this test http://www.humanmetrics.com/cgi-win/jtypes1.htm Print out the results page. Answer the following questions (bring hardcopies for me). 1. Briefly describe your "type". Click on your "type description" by Kiersey and Butt/Heiss and read about it, then summarize. 2. Do you agree with the results? Why or Why Not? 3. Click on the "jung career indicator" and write down the sugg'd careers. Do any look appealing? 4. Did you learn anything new about yourself? Are you surprised, happy, sad, ambivalent? Why? 5. How will this info affect your career path?
10/7	Meet with seminar speaker and attend the seminar

10/21	Job Preparation Assignment Chemistry 495 Fall 2011 • Choose a topic below (or develop one that you are interested in). Notify me asap. I want each person to present a different topic. • Prepare a 10 minute presentation using slides or some kind of visual information. • Make it clear and concise. • Dress casual. No t-shirts or shorts. • Make sure it is memorized with very few external queues. • You should check out sites devoted to "how to give a presentation"! • The presentation will be delivered on Friday October 28. 1. Aptitude Test taking tips (some of you will need to take the GRE for example, or other standardized tests) 2. Phone and In-person Interview tips (lots of sub-categories possible here, choose one or several) - preparing for… - dealing with tough questions - what to wear - dealing with different people (CEO vs hourly employees) - questions you should ask 3. Resume / CV tips 4. Cover letter tips 5. Application (written and/or online) tips 6. Selecting references / coaching recommenders 7. How to sell yourself 8. Building interpersonal skills
11/4	Michael Despeaux, Career Services, will visit and talk about job preparation. Assignment: Do the "perfect interview" and send to me. I will meet with each student to review and critique.
11/11	Meet with seminar speaker and attend the seminar
11/18	Meet with seminar speaker and attend the seminar
12/2	Meet with seminar speaker and attend the seminar

Important Dates

- Fall Break (no classes) = October 13-18
- Friday November 4 = last day to withdrawal
- Thanksgiving Break (no classes) = November 23-25

CHEM 535 Instrumental Analysis II / Advanced Instr. Lab for Graduate Students
Fall 2011 R 2-7pm NS 208

Instructor: Dr. Arthur Salido
Office: ST 416
Contact Info: x2587, email through Blackboard
Office Hours: Monday 2-4 or by appointment

I. Course Description

Aims: This course covers the theories and practices related to contemporary analytical instrumentation. Some essential skills that are required include the following: college-level reading proficiency, mastery of algebraic operations, and a very high capacity to grasp, analyze, and manipulate abstract concepts.

II. Specific Learning Objectives

Upon completion of this course, a student will be able to demonstrate competence in these areas:

a. Understanding contemporary instruments and related methods
b. Solving chemical problems
c. Understanding and applying chemical principles (demonstrated by test, quiz, lab and homework performance)
d. Making accurate physical and chemical measurements in laboratory
e. Using MS Excel to investigate complex equilibria, solve problems, plot, and manipulate recorded data**III.**

III. Course Materials

a. Rental textbook "PRINCIPAL OF INSTRUMENTAL ANALYSIS, 6TH EDN." Skoog
b. Scientific Calculator
c. MS Office
d. Goggles or Glasses
e. Gloves
f. Laboratory Notebook

IV. Faculty Expectations of Students and Course Policies

- Accommodations for students with disabilities:
  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require disability services or reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex.
- Academic Honesty Policy (as described in the Student Handbook):
  Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  a. *Cheating*—Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  b. *Fabrication*—Intentional falsification of information or citation in an academic exercise.
  c. *Plagiarism*—Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
  d. *Facilitation of Academic Dishonesty*—Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction.
  Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.
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Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- Blackboard:
  Blackboard, an online course management system, will be used as a source for class handouts, review material, and quizzes. You will also be able to check your grades for all assignments at any time.
  To access Blackboard, log in to MyCat using your 92-number and your PIN. Click the Blackboard link on the left side of the screen or, under the Personal Services tab, select Student Main Menu and follow the Blackboard link. You will see all of your courses at that time. Select CHEM 139 to access information for this course. Please let your instructor know ASAP if you have any trouble accessing the course.
- Communication:
  Your instructor will communicate any important class information to you via Blackboard and your Catamount e-mail address. A test email will be sent early in the semester to verify the class roll. Please check your WebCat and Catamount e-mail regularly during the semester. (Email can not be forwarded to a personal email account.)
- Cell Phones and Laptops:
  Please shut off cell phones. You are not allowed to use cell phones and laptops in class. If you need a laptop, you must get authorization from disability services, which will make justification for your need.
- Class Conduct:
  You are expected to act professionally, respectful and courteous toward others. It is your job to learn and my job to help you. Any activity that prevents this from happening will be remedied if possible.
- Attendance Policy:
  The more classes you attend, the better your grade. Students who miss class perform poorly and often must withdraw from the course. Attendance will be checked daily. It counts 4% of your final grade.
- Quizzes and In-Class Assignments:
  Quizzes will be assigned regularly in class and can not be made-up if missed. There may also be non-graded, in-class assignments (worksheets). You are expected to work on these assignments even though they are not graded because they are intended to help reinforce material covered in class. In some cases you may be allowed to work in groups or take the assignment home for completion.
- Tests:
  Three 50-minute tests will be given in class (see schedule below). If you miss a test, you will be given an alternate version (only once this semester). If you miss a second time, you will receive a zero for that test grade.
- Final Exam:
  The final exam is scheduled by the University (see schedule below). The final exam is cumulative.

V. Grading Procedures:
Final grades will be based on average performance on each of the components listed below. Each component is worth a certain percentage of the final grade as shown.

	Percentage of Final Grade
Attendance	4%
Quizzes / Misc. Assignments / Homework	10%
Tests	33%
Final Exam	20%
Laboratory	33%

Percentages will be converted to letter grades as follows:

Numerical Percentage	**Letter Grade**
>96%	A+

93% - 96%	A
90% - 92%	A-
87% - 89%	B+
83% - 86%	B
80% - 82%	B-
77% - 79%	C+
73% - 76%	C
70% - 72%	C-
67% - 69%	D+
63% -66%	D
60% - 62%	D-
<60%	F

VI. Tentative Course Schedule

This chart is the Test schedule. It is accurate on the dates BUT tentative on content. Extenuating circumstances could cause us to lag or exceed the schedule.

Test 1	Thursday September 29
Test 2	Thursday November 3
Test 3	Thursday Dec 1
Project Presentations	Thursday December 8
Final Exam	Monday December 12 (12-2:30)

VII. Laboratory: Projects

Goal: **Graduate student projects will be expected to be more advanced than undergraduate ones.**

- **Literature review should be more rigorous and extensive.**
- **Experiments will be expected to be more advanced and graduate students will work independently with little supervision from the instructor.**
- **Graduate student presentations and written reports will be double the length of the undergraduate ones.**
- **Grad students should limit group sizes to 2 people.**
- **Grad students should spend more time on their projects, like 3-6 hours per week.**

Time: You must spend 3-6 hrs per week working on your project. Most of the work will occur outside of regular class time. You will record your weekly activities in a lab notebook, that I will check regularly.

Strategy: Students who are already engaged in CHM 380 or CHM 698 research, will work on that project idea with some modification for this course. Students who are not already engaged in a project will either develop a new research project or choose one offered by Dr. Salido.

Project Ideas:
Can be anything as long as we have the supplies and instruments.
Modification of existing research: Undergraduate students who are already engaged in CHM 380 will focus on the instrumentation used in your research. For example, you may be involved in research where you synthesize something but characterize your compounds by NMR, or IR. For this course, you would focus on the NMR or IR aspects of your research. You could investigate questions like: what NMR or IR parameters could be adjusted to improve my signal? Could I use another technique like GCMS or LCMS to characterize my compounds? Another example: If you are using chromatography to separate compounds, you could design a project where you investigate how different solvent conditions (concentrations, pH, buffers), columns, flow rates, etc. affect your results. Before starting your project for this course, you should consult with your research advisor and with Dr. Salido to help clarify your project direction.

Project schedule and activities:

9/1 A group representative (GR) will email me the names of the group's members. The GR will represent the group but is not responsible for managing each assignment. The group should assign tasks, for example: GR is the spokesperson who hands assignments in, Secretary assembles the group's work and prepares if for submission, Instrument Expert, Method Expert….

9/8 GR must submit **3 topic ideas**. If the group is sure about the project topic at this point, then one topic is fine.

9/15 Each GR will hand in a **project title and one-paragraph overview** of the project that describes the **purpose** of the project, the **instrumental / experimental methods** to be used (as specific as possible – this may change during the semester), and **expected outcome** (s). If you are modifying existing chem 380 work, the overview must include your research advisor's signature which will indicate that you have discussed this project with him/her and that he/she thinks this is a suitable project topic. Ask your advisor if you can perform the experiments at a suitable time for them.

9/22 **Literature**: Each GR will give me **2-3 peer-reviewed journal articles** that are directly-relevant to your project, including a **one-paragraph summary of each article.**

9/29 **Methodology**: Each GR must hand in a fairly detailed description of their project procedure. Students should describe what instrument (s) will be used, what reagents / accessories / consumables will be needed, and when/where the experiments will occur.

10/6 **Revisions and Grade for Part 1** (everything so far):   If the project needs to be revised, the GR must submit changes in writing, including reasons. For example, if you found a new article, submit it to me.
Grade for Part 1: Each group member will comment on the work his/her peers are doing. This will be done anonymously. I don't want grades, just comments. I have been observing you as well so I will have my own grade to give.

Week of 10/20 **Start Experiments** (make sure I know, when/where you are doing experiments). I will need to meet with each group to develop a weekly schedule when I can meet with you and help.

10/27 – 12/1 **Activities Reports**: At the beginning of each lab, students should turn in a one or two paragraph summary of all project-related activities that they have been involved in since the beginning of the previous lab meeting. The report should include descriptions of experiments performed, any literature searches / reading, any data acquired, and any conclusions made. EVERYTHING (thoughts, data, conclusions, calculations) should be neatly written in their lab notebook and turned in.

12/8 Students will make a PowerPoint presentation of their project. Details will be given later. Final report guidelines are listed below.

Here are some guidelines to help you assemble your final report.

- 12 pt font, times new roman, 1in margins, double-spaced, ACS style references, page numbers, printed and handed in (in my mailbox, in person, or under my office door) by Wednesday Dec 7, 5pm.
- Turn in your lab notebook with your report.
- Abstract: A 5-10 sentence summary of the key information that will be found in your report.
- Research basis: Why are you doing this project? What problem are you trying to solve? You can include information from your research advisor.
- Background: Shed some light on how the problem is currently solved? What issues have to be taken into account? You should include citations here. Use the ACS format for bibliographies/references.
- Experimental: What you did, including an explicit-as-possible procedure. Include all reagents/instruments/methods used.
- Data/Results: both negative and positive
- Conclusions: How did your experiments get you closer to a solution? What were you able to conclude with the experiments that you did?
- Future Direction: If you weren't so lucky in your experiments, what future experiments should be performed to address the problem? What ideas do you have about the problem?
- Your thoughts: What did you think of this open-ended project? Did you like it? Did you or I overreach? How can it be made better? Would you prefer traditional lab experiments? Did you have enough time? Did you need more direction or accountability or did you prefer freedom to do what you wanted?
- This should be a 20pg or more manifesto (included in the 20 pages are all of the above sections plus figures/tables/references, so it should not be too bad)!

CHEM 553 Physical Chemistry II
Fall 2011
MWF 11:15-12:05, NS 208

Instructor: Dr. Carmen Huffman
Office: NS 212
Contact Info: 227-3682, chuffman@wcu.edu
Office Hours: MWF 9:30-11:00 or by appointment

Course Description In this course, you will study quantum mechanics, atomic and molecular spectroscopies and applications of thermodynamics. Three hours per week will be spent in lecture. This course is worth three credit hours. Prerequisites: CHEM 352, MATH 255, and PHYS 230, or equivalents. (Calculus is an important component for this course. If you have concerns about your math background, please see me right away.)

Learning Objectives By the end of this course, students will

- Recognize the differences between classical and quantum mechanics.
- Be able to use wavefunctions to describe one-, two-, and three-dimensional translational, vibrational, and rotational motion and energy.
- Be able to apply the laws of quantum mechanics to monatomic, diatomic, and polyatomic systems to predict or approximate energies.
- Be able to determine if spectroscopic transitions are allowed or forbidden and calculate their corresponding energies.
- Understand the principles governing pure rotational, vibrational, and electronic spectroscopies (including fluorescence and phosphorescence).

Students may also

- Be able to describe two bonding theories (valence bond and molecular orbital) and use those theories to predict molecular geometry and bond strength.
- Understand the origins of rate laws, use them to predict time dependent concentrations of products and reactants, and use them to propose reaction mechanisms.

Course Materials Materials for this course are listed below.

- Required text: Atkins, Peter, and Julio de Paula. *Physical Chemistry 7th ed.* New York: W. H. Freeman and Company, 2002. (This text is available for rent from the University Bookstore.)
- POGIL handouts, distributed in class and available via Blackboard.

Faculty Expectations Expectations of students and course policies are listed below.

- **Accommodations for students with disabilities**: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact the Office of Disability Services for more information at (828) 227-3886 or `lalexis@wcu.edu`. You may also visit the offices website: `disability.wcu.edu`.
- **Academic honest policy (as described in the Student Handbook)**: Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:
  - *Cheating* – Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
  - *Fabrication* – Intentional falsification of information or citation in an academic exercise.
  - *Plagiarism* – Intentionally or knowingly representing the words or ideas of someone else as ones own in an academic exercise.
  - *Facilitation of Academic Dishonesty* – Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

  Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of F in the course. Within 5 calendar days of the event the instructor will inform his or her department head (and the Associate Dean of the Graduate School if the student is a graduate student) in writing of the academic dishonesty charge and sanction.

  Please refer to the Student Handbook for procedures that will be followed in the event that academic dishonesty has been committed.
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them to drive to campus. *The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions.* Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions.

Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

- **Electronic devices**: The use of electronic devices during class can be distracting to your instructor and your classmates. Students who are texting, listening to music, or using a computer in class will be warned to stop unless a special exception has been made for that class period. Students who continue to text, play music, or use a computer will be asked to leave. Having any electronic devices visible during in-class quizzes or tests is strictly forbidden because they can be used for cheating.
- **Blackboard**: Blackboard will primarily be used as a source for handouts, study guides, old exams, and other important materials you can use to prepare for exams. You will also be able to check your grades for all assignments at any time. Please let the instructor know if you encounter difficulty accessing the course materials on Blackboard.
- **Communication**: Your instructor will communicate any important class information to you via email to your WCU account only. A test email will be sent early in the semester to verify the class roll. Please check your email regularly during the semester.
- **Attendance Policy**: Attendance to class is mandatory and will be monitored via daily quizzes. The two lowest quiz grades will be dropped to account for excused absences. As a courtesy, please notify your instructor *as soon as possible* if you know you will be absent or have missed a class. This is especially important if you know you will be absent for an extended period of time due to illness or other unusual circumstances.

POGIL Process-oriented guided-inquiry learning (POGIL) will be used to teach this course. This is a teaching strategy where students work in learning teams to explore and identify concepts and apply them to solving problems. Some students may not be familiar with this method, and may find difficult in the beginning. However, research has shown that this method is powerful in helping students understand and retain chemical concepts, and I believe (or at least hope) that, at the conclusion of this course, students will wish every course was taught in this manner. An additional handout with more details about this method will be provided.

Graded Work Your learning in this course will be evaluated by various graded coursework, listed below.

- **Homework**: Assignments will be given regularly in this course, as the only way to learn the material is to immerse yourself in it. All assignments must be turned in at *the beginning* of the class period in which it's due. A few problems from the assignment will be graded (at random). Graded assignments will be passed back to you.
- **Project**: As a graduate student, you will be required to write a 5-10 page paper on a subject related to, but not the same as, the material covered during lecture. Sample topics will be provided on or around October 7$^{\text{th}}$. However, with permission, you may write your paper on a topic of your choosing. The paper will be due November 22$^{\text{nd}}$. As the project approaches, more details will be forthcoming. Dates are subject to change, although once a topic is chosen, the due date will be fixed.
- **Quizzes**: Quizzes will be given daily in this course. Topics will be based on the previous class day's POGIL exercise or lecture material.
- **Exams**: There will be four in-class exams. All exams are mandatory, but the lowest exam grade is dropped. Tentative exam dates: W 09/14, F 10/07, M 11/07, and M 12/05.
- **Final exam**: The final exam is scheduled for Monday, Dec 12th, 3:00-5:30. The exam will be cumulative.

Grade Determination A student's scores on homework, quizzes, exams, and the final exam will be used to determine his or her final grade for the course. (Any graded POGIL activities will fall under the "homework" category.) These scores will be weighted as defined in the table below.

Graded work	**Weight**
Homework	15%
Project	15%
Quizzes	10%
Exams	40%
Final Exam	20%

Tentative Course Topics A list of topics to be covered in this class are given below. The list is subject to change.

Course Topic	Reading in Text
Introduction to Quantum Mechanics	
Origins of quantum mechanics, quantum chemical principles	11.1-11.2
Wavefunctions, mathematics for quantum mechanics	11.3-11.6
Types of motion and energy	
Translational motion: particle in a box	12.1
Translational motion: particle in a 2-D/3-D box	12.2
Vibrational motion: harmonic oscillator	12.4-12.5
Rotational motion: angular momentum, moment of inertia and spherical polar coordinates	12.6
Rotational motion: particle on a ring	12.6
Rotational motion: particle on a sphere	12.7
Rotational motion: spin	12.8
Atomic structure	
Hydrogenic atoms	13.1
Orbitals, quantum numbers, electron configurations	13.2, 13.4
Spin-orbit coupling, term symbols	13.9
Selection rules	13.3, 13.9
Molecular structure	
Born-Oppenheimer approximation	14
Valence bond theory	14.1
Homonuclear diatomics	14.2
Polyatomic molecules	14.3
Molecular orbital theory	14.4
Homonuclear diatomics (again)	14.5
Heteronuclear diatomics	14.6
Variational theory	14.7
Hückel theory	14.8
Spectroscopy	
Types of spectroscopy and electromagnetic radiation	16.1
Spectral line width and intensities	16.2-16.3
Atomic spectroscopy: Balmer series	13.1
Rotational spectroscopy: Microwave	16.4-16.6
Rotational Raman spectroscopy	16.7
Vibrational spectroscopy: Infrared	16.9-16.11
Rotational-vibrational spectroscopy: Infrared	16.12
Vibrational Raman spectroscopy	16.13
Vibrational spectroscopy of polyatomics	16.14-16.16
Electronic spectroscopy: Franck-Condon priniciple	17.1
Electronic spectroscopy: UV/vis, fluorescence & phosphorescence	17.3

Chemistry 561—Environmental Chemistry
Spring 2011

Lecture:	MWF 10:10-11:00, ST 143
Text:	*Environmental Toxicology & Chemistry*, Crosby, Oxford, 1998.
Instructor:	Dr. Cynthia Atterholt
Office Hours:	231A Natural Sciences, MWF 11:00-12:00, or by appointment
Phone Number:	227-3667 e-mail: atterholt@email.wcu.edu

Course Description:

Environmental Chemistry is defined as "***the study of the sources, reactions, transport, effects, and fates of chemical species in the water, soil, air, and living environments***," and is thus inherently an interdisciplinary science. We will be studying common environmental contaminants, physical and chemical properties of environmental chemicals, transport of contaminants in the environment (air and water), chemical transformations of contaminants, toxicology, environmental exposure and risk, and predicting environmental fate and effects of chemicals.

Tentative **Course Outline:**

Chapter 1	Environmental toxicology and chemistry
Chapter 2	Environmental chemicals
Chapter 3	Environmental chemodynamics
Chapter 4	Environmental transport
Chapter 5	Abiotic transformations
Chapter 6	Biotransformations
Chapter 11	Inorganic toxicants
Chapter 13	Industrial chemicals
Chapter 14	Refractory pollutants
Chapter 15	Reactive pollutants
Chapter 16	Predicting environmental fate and effects

Grading:

3 Midterm Exams (20% each)	60%
Final Exam	20%
Homework, Reports, Papers, Attendance	20%

90-100% = A; 80-89% = B; 70-79% = C; 60-69% =D; $\leq$59% = F

Homework:

Assignments may include homework problems, short papers, group projects, presentations, classroom debates, and summary statements of current environmental issues or research. Homework is due at the beginning of class. Homework not turned in at the beginning of class will have points deducted for being late.

Graduate students are required to write an 8-10 page research paper on a current environmental issue. The research paper should preferably be written on an area of environmental chemistry related to the student's thesis topic. Also, graduate student assignments may be more in-depth than some undergraduate assignments.

Academic Honesty:

I expect all students to adhere to the university's policy on academic honesty. Students who violate this policy on exams or other graded material may receive a grade F for the entire course.

Exams:

Exam 1: February 11; Exam 2: March 21; Exam 3: April 18
Final Exam: Wednesday, May 4 from 8:30 to 11:00 pm.

Accommodations for Students with Disabilities:

Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex. You may also visit the office's website: http://www.wcu.edu/12789.asp

Spring 2012

Tuesday and Thursday, 11:00 AM to 1:50 PM
Stillwell 419 *and* Natural Sciences 217

Course Information:

For the 1st half of the semester from 1/10 to 2/28

Dr. Channa R. De Silva
Office: NSB 213
Phone: 3637
E-mail: mhdesilva@email.wcu.edu
Office hours: In lab

For the 2nd half of the semester from 3/6 to 4/26

Dr. William R. Kwochka
Office: NSB 225
Phone: 3673
E-mail: kwochka@wcu.edu
Office hours: In lab

Text: Selected reading from the literature.

Course Description and Purpose: This course is designed to be an extension of the sophomore organic chemistry lab (CHEM 272) and serve as an introduction to advanced inorganic and organic synthesis. We will begin the semester by synthesizing simple molecules and complexes that do not require very delicate procedures and gradually move toward more complicated reactions that require inert atmospheres and good technical skill. This course will emphasize the techniques involved in synthetic chemistry such as purification of starting materials, running the reaction, workup of the reaction, purification of the reaction product, and, finally, characterization of the materials via ^{1}H, ^{13}C NMR (both in one and two dimensions), and spectroscopic techniques such as FT-IR, UV-Visible, and fluorescence.

In addition, we will place a great deal of emphasis on searching the scientific literature (both electronic and bound periodicals) and on scientific writing with specific journals like the *Journal of Organic Chemistry* and *Inorganic Chemistry* in mind. Some experiments will require short setup times with little time actually spent performing the reaction; others may need constant attention. You should plan to use this “down” time to work on (in the lab or in the library) future experiments. Be prepared to put in some odd hours.

Course Objectives: Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an excitement to learn. You will participate in all laboratory activities by: reading assigned material, participating in classroom discussions, performing experiments in the laboratory, and contributing in other creative ways for the benefit of you and the class. Specific learning objectives include (1) development of advanced inorganic and organic synthetic chemistry skills and materials characterization techniques, (2) development of synthetic chemistry related problem solving skills, (3) development of scientific reasoning skills, and (4) improvement of independent research skills in chemical sciences.

Course Outline: The semester will be divided into two parts: the first ½ of the semester (De Silva, 14 class meetings) will be spent on synthetic **inorganic** chemical reactions and techniques and the second ½ of the semester (Kwochka, 14 class meetings) will involve synthetic **organic** chemical reactions and their corresponding techniques. Midterm break conveniently separates the two halves of the semester. The following is a **tentative** schedule for labs during the semester:

De Silva: from 1/10 to 2/28

Synthesis and Characterization of Transition Metal Acetylacetonate Complexes (100 points)	Handouts and references to be provided
Determination of Crystal field Splitting Energy of Transition Metal Complexes (100 points)	Handouts and references to be provided
Investigation of Molecular Fluxionality of an Allylpalladium Complex (100 points)	Handouts and references to be provided
Luminescence Property Investigation of Europium Metal Complexes (100 points)	Handouts and references to be provided

Revised: WRK, 1/6/2012

Introduction to Nanomaterials: Synthesis of Luminescence Nanoparticles (could be extended to a project proposal) (50 points)	Handouts and references to be provided

Kwochka: from 3/6 to 4/26

General topics for experiments in the lab	For information about each of these topics, please see the following websites. I encourage you to check out the "biographical" and "Nobel lecture" sections for each laureate, as well some of the other aspects of this site. Specific experimental procedures will be made available by midterm break
Discovery and development of the diene synthesis: **Diels-Alder** Reaction *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1950/#
Palladium-catalyzed cross couplings in organic synthesis: **Suzuki-Miyaura** Coupling *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2010/suzuki.html
Development of the metathesis method in organic synthesis: **Grubbs** Ring Closing Metathesis *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/2005/grubbs.html
Development and use of molecules with structure-specific interactions of high selectivity: **Pedersen** Crown Ether Synthesis *(100 points)*	http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1987/pedersen.html

CHEM 572 Project:

Students registered for CHEM 572 are expected to complete a brief research project as part of the inorganic component in addition to the standard experiments planned above. Further details about the project will be provided during the first week of classes. Guidelines for the synthetic project (200 points).

i. Selection of the project and identify the reaction conditions
ii. Outline of a plan for the synthesis and one to two page written proposal
iii. Gather chemicals, and plan the reaction set up
iv. Run reaction; product isolation, purification, and characterization
v. Write-up full paper according to *Inorganic Chemistry* format
vi. 10-15 minute Power Point presentation of the project

Grading Policy: There will be no exams in this course. The final grade will be based upon a report (either a formal lab write-up or a worksheet) of each of the synthetic schemes along with, at times, your lab notebook. The grade scheme is as follows; **A** = 100-90, **B** = 89-80, **C** = 79 – 70, **D** = 69 – 60, and **F** = 60 and below.

Class Attendance: Attendance is required. Your grade may be reduced if you miss more than two classes. Cell phones must be turned off during lecture hours except emergency situations. Violations may result in loss of credit for the course. You may also be asked to leave the laboratory.

Communication: Your instructors will communicate any important class information to you during the laboratory meetings or via email and blackboard, email will be sent to your WCU account. You are responsible for keeping this account open. If you use another email account, it is your responsibility to forward email from your WCU account to the one you use more frequently. Please check your email regularly during the semester.

Laboratory reports, Homework, Reading assignments, and Quizzes: Each report will be due approximately 1-2 weeks after the experiment is completed. More information about the specific requirements for each experiment will be provided at the appropriate time. We will be doing a writing experiment this semester by using a grading rubric. The intention is to provide some clarity about the expectations for writing assignments. *Late laboratory assignments will not be accepted.* The first formal write-up you will be given the opportunity to revise your report for a better grade. *All rewrites must be accompanied by the original draft and grade sheet.* A rewrite that is missing the original draft and grading rubric sheet will be considered late and points deducted accordingly.

Homework or quizzes may be assigned, collected, and graded. You are expected to participate in class discussions and complete reading assignments.

Revised: WRK, 1/6/2012

Academic Honesty Policy: Western Carolina University, as a community of scholarship, is also a community of honor. Faculty, staff, administrators, and students work together to achieve the highest standards of honesty and integrity. Academic dishonesty is a serious offense at Western Carolina University because it threatens the quality of scholarship and defrauds those who depend on knowledge and integrity. Academic dishonesty includes:

- **Cheating** - Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.
- **Fabrication** - Intentional falsification of information or citation in an academic exercise.
- **Plagiarism** - Intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
- **Facilitation of Academic Dishonesty** - Intentionally or knowingly helping or attempting to help someone else to commit an act of academic dishonesty, such as knowingly allowing another to copy information during an examination or other academic exercise.

Instructors have the right to determine the appropriate sanction or sanctions for academic dishonesty within their courses up to and including a final grade of "F" in the course. Within 5 calendar days of the event the instructor will inform his /her department head and the Associate Dean of the Graduate School when the student is a graduate student, in writing of the academic dishonesty charge and sanction. For more information about the academic honesty policy please see the WCU Student Handbook.

Inclement weather policy (as described in the Student Handbook): The University does not, as a matter of general practice, close its operations or cancel classes in Cullowhee because of bad weather. Many Western students commute from different distances and directions and weather conditions for those students may vary greatly from conditions on the Cullowhee campus. Students are advised to check road conditions in their areas and determine whether it is reasonable for them to drive to campus. **The University expects students to make every effort to attend class but not to jeopardize their safety by driving during dangerous conditions.** Faculty members will accommodate those students who are unable to attend class because of hazardous weather conditions.

Should the decision be reached to modify daily operations, Public Relations will announce modifications to the University schedule via media outlets, the University website and email. In addition, students, faculty and staff are encouraged to check the University website when the possibility of adverse weather arises. Updates about the status of University operations will be posted on a continuing basis. Please refer to the WCU weather policy for more information regarding school closures.

Accommodations for Students with Disabilities: Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities and/or medical conditions. Students who require reasonable accommodations must identify themselves as having a disability and/or medical condition and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact the Office of Disability Services for more information at (828) 227-3886 or lalexis@wcu.edu. You may also visit the office's website: disability.wcu.edu

There will be no lab meetings on **February 21** (Advising Day), **March 1** (Midterm Break), or **April 3, 5** (Spring Break).

*We have only **28** meetings this semester, so let's get busy!*

Revised: WRK, 1/6/2012

Syllabus - CHEM 593 (Advanced Inorganic Chemistry)
Spring 2012

Course Information

Lecture Meeting Time: Mon, Wed, Fri at 12:20 – 1:10 pm Location: NS 308

Lecture Instructor: Dr. Channa R. De Silva Office: NS 213 Phone: 828-227-3637

Email: mhdesilva@wcu.edu

Office Hours: Mon, Wed, Fri (1:15 – 2:30 pm) or by appointment

Text: Inorganic Chemistry, Principles of Structure and Reactivity by Huheey, Keiter, and Keiter, 4th edition.

Supplementary Reading: Any Inorganic Chemistry text book and Inorganic Chemistry journal articles. Relevant lecture materials, homework assignments, and quizzes will be posted on blackboard.

Course Description and Purpose

This course is an introduction to advanced inorganic chemistry concepts. The course materials are designed to prepare students for higher studies and chemical industry and to develop their knowledge on modern interdisciplinary areas of inorganic chemistry. Course materials will include a comprehensive examination of the physical and chemical properties of inorganic materials with an emphasis on chemical reactivity and structure, spectroscopy, catalysis, nanotechnology, bioinorganic chemistry.

Course Objectives

Enrollment in this course presumes successful completion of the prerequisites for the course, an open mind and an excitement to learn. You will participate in all class activities by: reading assigned material; doing homework and presentations; participating in classroom discussions; and contributing in other creative ways for the benefit of you and the class. Specific learning objectives include (1) understanding of advanced inorganic chemistry concepts (2) development of inorganic chemistry related problem solving skills, (3) development of scientific reasoning skills, and (4) applications to the fields of materials science, nanotechnology, and bioinorganic chemistry.

Class Attendance

Attendance is required. Your grade may be reduced if you miss more than two classes. Cell phones must be turned off during lecture hours except emergency situations. Violations may result in loss of credit for the course. You may also be asked to leave the lecture hall. Web browsing and other computer-related activities are not allowed during the lecture hours.

Communication
Your instructor will communicate any important class information to you via email. Email will be sent to your WCU account. You are responsible for keeping this account open. If you use another email account, it is your responsibility to forward email from your WCU account to the one you use more frequently. **Email messages will not be sent directly to non-university accounts.** Please check your email regularly during the semester.

Exams

Three hourly exams will be given in addition to the final exam. There will be no make-up exams. All exams will be given in the room where your lecture normally meets. Tentative exam dates are February 8th, March 14th, and April 18th, 2012. Final exam will be held at 3.00-5.30 pm on the 1st of May, 2012 (please refer to the registrar's website).

Homework, Reading assignments, Participation, and Quizzes

Homework will be assigned, collected, and graded. You are expected to participate in class discussions and complete reading assignments. You may be assigned topics for class presentations. <u>Late homework and other late assignments will NOT be accepted</u>.

Class Presentation
In addition to the above assignments you are expected to carry out a class presentation. The topics for your presentation and other relevant information will be provided during the first week of classes. Please make plans and prepare your presentation in advance.

Grade Determination

Assignment	Points
Exam 1	100
Exam 2	100
Exam 3	100
Final Exam	200
Homework and Quizzes	200
Class Participation	50
Class Presentation	200
TOTAL	950

Grading

Final grades will be based on percentage of the total points from three hourly exams, the final exam, and other assignments as shown above. The grade scheme is as follows; A = 100-90, B = 89-80, C = 79 – 70, D = 69 – 60, and F = 60 and below.

Outline of the Topics

- Symmetry and Group Theory
- Coordination Chemistry (structure, reactivity, bonding, spectra, and magnetism)
- Organometallic Chemistry
- Inorganic Metal Clusters
- Reactions and Catalysis of Organometallic Complexes
- Inorganic Chemistry of Biological Systems
- Inorganic Complexes in Medicinal Chemistry
- Inorganic Chemistry and Nanotechnology
- Lanthanide Chemistry

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c) **Plagiarism—**intentionally or knowingly representing the words or ideas of someone else as one's own in an academic exercise.
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Good Luck and Enjoy Inorganic Chemistry ☺

CHEM 696: Chemistry Seminar

Department of Chemistry & Physics, Western Carolina University, Cullowhee, NC

Fall 2011
Natural Sciences Building 308
Friday 2:30pm – 4:30pm

Instructor: David Evanoff
Office: NS 325A
Email: devanoff@email.wcu.edu
Phone: x2829
Office Hours: by appointment
AOL IM: DaveEvanoff (available during office hours)

I. Course Aims and Objectives

- The purpose of this course is threefold: 1. Develop your oral and written communication skills, 2. Increase you understanding and appreciation of the broad discipline of chemistry – both as a profession and a field of study, and 3. Assist in your progress towards your professional goals.
- This semester, these goals will be addressed by participating in a variety of public speaking activities developed by the *National Forensics League*.
- Master's students who are not new this semester but have not yet turned in a research prospectus will be required to do so. An approved prospectus must be turned over to the Graduate School no later than November 18, 2011. In addition, each continuing M.S. must meet with their TRAC committee to discuss their progress and provide documentation to the Instructor by December 9, 2011. New M.S. students should pick and advisor/TRAC committee/project as soon as possible.

II. Course Policies/Procedures

- Statement on Accommodations for students with disabilities:

  Western Carolina University is committed to providing equal educational opportunities for students with documented disabilities. Students who require reasonable accommodations must identify themselves as having a disability and provide current diagnostic documentation to Disability Services. All information is confidential. Please contact Disability Services for more information at (828) 227-2716 or 144 Killian Annex. You can also visit the office's website: http://www.wcu.edu/12789.asp.
- Statement on Academic Integrity (source: WCU Undergraduate Catalog):

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  I will determine the appropriate first-offense sanction for academic dishonesty within my courses up to and including a final course grade of "F." Multiple offenses will result in a failing course grade. See your catalog for more information.

- Attendance Policy

  You are expected to attend and actively participate in each class meeting. Of the utmost importance is attendance of external speaker seminars. **Provided that you have been given *three* weeks notice of an external speaker, your absence from that seminar will not be tolerated and will result in a 10% grade reduction**. An opportunity to meet with the speaker will be scheduled for 2:30pm on the Friday of the speaker's visit. Each of you is expected to attend these and make the speaker feel engaged and welcome. Except for extraordinary circumstances, **late assignments will not be accepted.** Thus, missing your scheduled time to present will negatively impact your grade. I understand that inclement weather may cause absence for commuters and will be accommodating in those cases, although students are expected to make every reasonable effort to attend class.
- Assignments

  Each student will participate in 5 events defined by the *National Forensics League*. Grades are largely participatory, assuming that students display a reasonable level of preparedness/willingness to participate. No two events can utilize the same topic or printed work. Each competition will result in 1st, 2nd, and 3rd place rankings, as voted by the students, instructor, and any guests. Students will be expected to turn in a one page summary the following week discussing whether they agree or disagree with the final rankings and why. For example, what did the 1st place student do that stood out? Did you feel that the 3rd place student should have been given 2nd place? Students in the overall 1st, 2nd, and 3rd place will receive some sort of prize…likely non-monetary (sorry!). No multimedia visual aids will be permitted in any of these speeches. The focus of these assignments is on the ability to convey ideas solely through speech.

  1. **Impromptu Speaking** – a speech delivered on the spur of the moment, off-the-cuff, with little or no preparation. Topics will be chosen by drawing and may include proverbs, abstract words, events, quotations, famous people, common household items, etc. Speeches do not need to be factual. 5 minutes of prep; 5 minutes to speak; no notes; no reference materials available.
  2. **Storytelling** – A single published, printed story, anecdote, tale, myth, or legend must be retold without notes or props. Students will submit the title of the story 1 week prior. 5 minutes to speak; no notes; no reference materials available.
  3. **Prose or poetry** – A student will read a published work of prose or poetry, no plays or other dramatic works are allowed. Students will submit the title of the story 1 week prior. 5 minutes to speak; notes are required; no reference materials available.
  4. **Extemporaneous Speaking** – Students will be given 30 minutes to prepare a 7 minute speech on a chemistry-related topic chosen via drawing. During the 30 minute prep time, the student may use resources provided by the instructor. Topics will be "scientific American" in difficulty and resulting speeches may be either informative or persuasive. Students may make notes during their prep, but those notes may not be used during the speech.
  5. ***Public Forum Debate** – In teams of 2, students will debate the advocacy of a chemistry related topic. The format of the debate will follow NFL rules. Topics will be picked by drawing and coin tosses will be used to determine initial team pairings, which team draws the topic, the position of the team, and the speaking order. Teams will have 1 week to prepare their arguments. After the 4 initial teams have debated, the two winning teams will debate a new topic, and the two losing teams will debate a new topic. Each debate will last a total of 33 minutes, based on NFL rules (see rule book in blackboard). Notes are allowed

  The first speech will be closed to the public, but all remaining will be open. ***requires professional dress.**
- Participation at External Seminars

  Asking questions of the speaker at the external seminars is part of the class participation grade. **At the conclusion of each seminar, each student is required to submit a 1 – 2 sentence summary of the presentation as well as one question that you asked or would have asked.**
- Selection of a Research Director/Project

  First year MS students will be expected to select a research director and a research project. If you have not already chosen an advisor, you should meet with at least three members of the graduate faculty accepting students and discuss possible research projects with that faculty member. After you select a research director and a project, the director and you should choose the members of your thesis research advisory committee (TRAC). The TRAC will consist of at least three members. A chemistry/physics faculty member must be the chair or co-chair of all TRACs. At least half of the TRAC members must be faculty from the department. Failure to choose a TRAC committee by the end of the semester will result in an "incomplete" in seminar.

- Prospectus

  You are expected to hand over your *approved* prospectus to all necessary parties by November 18th. **Please provide a copy of the signed cover sheet to me for grading. Failure to submit your signed cover sheet will result in an incomplete in the course.** The prospectus (thesis proposal) is a written statement of the research you plan to do in order to obtain your Master of Science degree. Generally this is a relatively short (2-5 pages) document which includes a brief introduction of the justification of the project, along with your hypothesis, an experimental section that describes the instrumentation and procedures that will be employed, a discussion section that lists the results you expect to obtain and methods to treat the data, and a brief conclusion. You should think of the prospectus as a contract between you and the thesis research advisory committee (TRAC). When you complete the work described in the prospectus, you have finished your experimental work. You need to begin working immediately. As such, I have placed several due dates throughout the semester to ensure your progress, although I encourage you to work ahead of these dates.
- TRAC Meeting/Report

  The student will serve as the recording secretary of each meeting of the TRAC. The minutes, or report, of each meeting should be submitted to the Graduate Coordinator. **A copy of the signed cover sheet should also be submitted to me. Failure to submit your signed cover sheet will result in an incomplete.** The report must be signed by the student and the research director. The report should be brief (1-2 pages) and include coursework requirements to be met for the degree, a statement of progress on the research, the anticipated completion date of major components of the research, the anticipated completion date of the research project, the anticipated date of the thesis defense, and the anticipated date for completion of all degree requirements.

III. Grading Procedures:

	1st Semester M.S.	Continuing M.S., prospectus not yet approved	Continuing M.S. prospectus previously approved
External Seminar Summaries/Questions	10%	10%	10%
1-4 speeches	12.5% (50% total)	12.5% (50% total)	12.5% (50% total)
Debates	30% (for two debates)	30% (for two debates)	30% (for two debates)
Speech feedback	10%	10%	10%
Choose advisor/TRAC	X		
Prospectus Approved		X	
TRAC meeting	X	X	X

Letter grades will be determined using the following scale:

A	100% – 88%	C	74% – 65%
B	87% – 75%	F	64% – 0%

CHEM 698: Research in Chemistry

Department of Chemistry & Physics, Western Carolina University, Cullowhee, NC
Hours to be determined; NSB 323

Instructor: Dr. David Evanoff
Office: NS 325A
Email: devanoff@email.wcu.edu
Phone: x2829
Office Hours: by appointment.

I. Course Description

The purpose of this course is to conduct original research, pursuant to the goals of your research advisor, in the pursuit of a Master's degree. Dissemination of research results in an appropriate venue, as well as adherence to University policies regarding progress towards graduation are also requirements of this course.

II. Course Policies

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- Statement on Academic Integrity (source: WCU 2011-2012 Graduate Catalog):

  Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of the Academic Integrity Policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. While academic in scope, any violation of this policy is by nature, a violation of the Code of Student Conduct and will follow the same conduct process (see ArticleVII.B.1.a.). If the charge occurs close to the end of an academic semester or term or in the event of the reasonable need of either party for additional time to gather information timelines may be extended at the discretion of the Department of Student Community Ethics (DSCE). Violations of the policy include:

  ***Cheating -** Intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise.*

  ***Fabrication -** Intentional falsification of information or citation in an academic exercise.*

  ***Plagiarism** – Intentionally representing the words or ideas of someone else as one's own in an academic exercise.*

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  I will determine the appropriate first-offense sanction for academic dishonesty within my courses up to and including a final course grade of "F." See your undergraduate catalog for more information.
- Attendance Policy

  Each hour of credit registered requires 3 hours of lab work per week. A student registered for 3 sections of research at 3 hrs of credit for each section is required to spend 27 hours per week in lab. In reality, that likely is not be enough time to make satisfactory progress towards graduation. Please budget time accordingly and remember that research must not be given a lower priority than any other WCU-related commitments.

  In addition to required lab time, a weekly meeting with your research advisor is also required to discuss progress. This meeting will result in an acceptable/unacceptable rating for that week's research.
- Assignments
  1. The research director and student will determine the goals for the semester. Acceptable progress must be made each week. A weekly meeting with your research advisor is also required to discuss progress. Laboratory notebook and any processed data (either hard copy or electronic) should be brought to this

meeting. This meeting will result in an acceptable/unacceptable rating for that week's research. If a student fails to make acceptable progress for five weeks during the semester, the maximum grade for research will be reduced by one letter grade. Likewise, failure to make progress for ten or more weeks during the semester will result in a failing grade.

2. A prospectus must be completed this semester. Early completion of the prospectus in order to be able to focus on research is an absolute necessity. Failure to submit a completed prospectus to your committee by September 22, 2011 will result in reduction of the research grade by one letter grade. Likewise, failure to defend the prospectus by October 6th, 2011 (unless there is an unavoidable committee scheduling conflict) will result in a grade reduction.
3. Provided that funds to travel can be obtained for you by your research director, research progress must be disseminated this semester at the regional ACS conference, SERMACS. Abstracts are due September 20th. We will submit a reasonable abstract in which all points mentioned in the abstract should be easily completed in time to present. Failure to suitably complete the research described in the abstract (and thus a cancellation of your poster) will result in a one letter grade reduction of the research grade.
4. Research progress must be presented during a group meeting with other research students at the end of the semester. Failure to suitably complete this assignment will result in a one letter grade reduction of the research grade. The quality of this presentation should be equal to a presentation given to your TRAC members.

- Scheduling

  Scheduling will be maintained via a shared outlook calendar with your employee email account. Keep this calendar up to date.

VI. Grading Procedures:

In this course, your research director will assume that you will complete 'A'-level work throughout the semester. Failure to satisfactorily complete the assignments listed above will cause a reduction in this grade. Please note that these reductions are additive. Letter grades will be determined using the following scale:

A =	completing all listed assignments above
B=	completing all but one assignment listed above
C=	completing all but two assignments listed above
F=	can be obtained by either not making satisfactory progress for 10 or more weeks, or not satisfactorily completing three of the above listed assignments

C.4 Frequency of course offerings and enrollment for the previous five years

See table on the following page. Entries with a dash indicate that a course was not offered that semester.

Course	Sum06	F06	S07	Sum07	F07	S08	Sum08	F08	S09	Sum09	F09	S10	Sum10	F10	S11
CHEM 101	208	206	160	256	222	192	188	184	178	78	216	202	62	270	183
CHEM 132	-	600	229	-	481	169	-	438	146	24	559	159	24	580	190
CHEM 133	30	96	300	23	110	282	94	108	290	40	71	539	42	84	360
CHEM 139	-	-	-	-	116	91	-	261	144	18	514	230	30	632	281
CHEM 140	34	245	168	30	176	182	56	128	214	38	164	361	46	198	315
CHEM 190	-	21	-	-	21	-	-	-	-	-	-	-	-	-	-
CHEM 191	-	44	-	-	14	-	-	-	-	-	-	-	-	-	-
CHEM 192	-	44	-	-	-	-	-	-	-	-	22	-	-	-	-
CHEM 194	-	46	-	-	44	-	-	44	-	-	-	-	-	-	-
CHEM 232	-	26	44	-	38	28	-	26	52	-	34	58	-	56	66
CHEM 241	-	61	43	-	61	30	-	70	40	14	78	41	16	103	58
CHEM 242	32	29	43	21	29	53	60	10	51	17	36	56	18	35	66
CHEM 272	23	18	43	11	18	50	26	18	43	11	32	47	16	27	65
CHEM 321	-	22	-	-	15	-	-	13	-	-	12	-	-	21	-
CHEM 330	-	28	-	-	36	-	-	42	-	-	43	-	-	49	-
CHEM 352	-	-	26	-	-	22	-	-	20	-	-	19	-	-	26
CHEM 361	-	26	11	-	15	14	-	16	11	-	16	9	-	15	20
CHEM 370	-	56	-	-	50	-	-	53	-	-	34	-	-	-	63
CHEM 371	-	-	12	-	-	14	-	-	22	-	-	16	-	-	14
CHEM 380	7	14	15	4	13	27	8	23	16	-	17	11	4	17	25
CHEM 389	1	-	-	1	-	-	-	-	-	-	3	-	2	-	-
CHEM 421	-	-	-	-	-	-	-	-	1	-	-	-	-	-	2
CHEM 432	-	-	10	-	-	8	-	-	9	-	-	9	-	-	-
CHEM 441	-	-	-	-	-	-	-	5	-	-	-	-	-	1	-
CHEM 453	-	8	-	-	6	-	-	12	-	-	6	-	-	7	-
CHEM 461	-	-	9	-	-	-	-	-	3	-	-	-	-	-	14
CHEM 465	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-
CHEM 470	-	-	8	-	-	7	-	-	10	-	-	8	-	-	-
CHEM 472	-	-	-	-	18	-	-	-	9	-	-	-	-	16	-
CHEM 493	1	6	14	-	8	22	-	-	8	-	7	4	-	-	4
CHEM 495	-	1	14	-	3	20	-	5	11	-	2	16	-	-	24
CHEM 532	-	-	2	-	-	1	-	-	6	-	-	4	-	-	-

. . . continued on next page . . .

Course	**Sum06**	**F06**	**S07**	**Sum07**	**F07**	**S08**	**Sum08**	**F08**	**S09**	**Sum09**	**F09**	**S10**	**Sum10**	**F10**	**S11**
CHEM 541	-	-	-	-	-	-	-	11	-	-	-	-	-	7	-
CHEM 553	-	1	-	-	2	-	-	3	-	-	6	-	-	1	-
CHEM 561	-	-	4	-	-	-	-	-	8	-	-	-	-	-	2
CHEM 565	-	-	-	-	-	-	-	-	-	-	-	-	-	12	-
CHEM 570	-	-	-	-	-	-	-	-	4	-	-	4	-	-	-
CHEM 593	-	4	11	-	18	18	2	7	16	1	18	16	1	8	9
CHEM 696	-	9	10	1	12	9	-	9	11	-	15	13	-	12	9
CHEM 698	6	18	12		16	19	4	13	15	1	19	22	4	15	17
CHEM 699	-	2	5	-	2	5	2	1	2	-	1	5	-	3	1
CHEM 799	-	2	-	-	2	4	8	3	1	1	3	3	2	3	2

C.5 Number of junior and senior majors and number of graduate students for the previous five years

Source: WCU Fact Books (`http://www.wcu.edu/13166.asp`)

	2007	2008	2009	2010	2011
Jr/Sr undergraduate majors	55	47	42	39	51
Graduate students	13	15	18	16	11

C.6 Time to degree data for program graduates for the previous five years

Year	Undergraduate		Graduate	
	# Graduated	Time to Degree	# Graduated	Time to Degree
2006/2007	11	3.7	4	2.4
2007/2008	9	3.2	2	2.7
2008/2009	16	3.8	5	2.3
2009/2010	19	3.6	7	3.3
2010/2011	11	5.1	5	3.6

C.7 Course sequence for 4-year and 2-year graduation

B.S. in Chemistry, General Concentration
Suggested Course Sequence for 8-semester plan

Freshman Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 139* - General Chemistry I	4	CHEM 140* - Advanced General Chemistry	4
MATH 153 - Calculus I	4	MATH 255 - Calculus II	4
1st yr. seminar or ENGL 101	3	1st yr. seminar or ENGL 101	3
LS** or elective	3	LS or elective	3
total	14	*total*	14

Sophomore Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 232* - Quantitative Analysis	4	CHEM 242 - Organic Chemistry II	3
CHEM 241 - Organic Chemistry I	3	CHEM 272* - Organic Chemistry Lab	2
LS, elective or ENGL 202	3	PHYS 230* - General Physics I	4
LS or elective	3	LS, elective or ENGL 202	3
LS or elective	3	LS or elective	3
total	16	*total*	15

Junior Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 321 - Inorganic Chemistry	3	CHEM 352 - Physical Chemistry I	3
PHYS 231* - General Physics II	4	CHEM 370* - Instrumental Analysis I	4
LS or elective	3	CHEM 495 - Seminar in Chemistry	1
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	3
total	16	*total*	14

Senior Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 472* - Chemical Syntheses	2	CHEM 361 - Principles of Biochemistry	3
Chemistry elective	3	CHEM 371* - Chemical Dynamics	2
LS or elective	3	Chemistry elective	3
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	3
LS or elective	3		
total	17	*total*	14

* This course has a laboratory component.
** LS = liberal studies course

Updated: 08/27/2011 (CLH)

B.S. in Chemistry, Premedical/Biomedical Science & Technology Concentration
Suggested Course Sequence for 8-semester plan

Freshman Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 139* - General Chemistry I	4	CHEM 140* - Advanced General Chemistry	4
MATH 153 - Calculus I	4	BIOL 140* - Principles of Biology I	4
1st yr. seminar or ENGL 101	3	1st yr. seminar or ENGL 101	3
LS** or elective	3	LS or elective	3
total	14	*total*	14

Sophomore Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 232* - Quantitative Analysis	4	CHEM 242 - Organic Chemistry II	3
CHEM 241 - Organic Chemistry I	3	CHEM 272* - Organic Chemistry Lab	2
BIOL 141* - Principles of Biology II	4	PHYS 130 or 230* - Intro. or Gen. Physics I	4
LS, elective or ENGL 202	3	LS, elective or ENGL 202	3
		LS or elective	3
total	14	*total*	15

Junior Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 321 - Inorganic Chemistry	3	CHEM 352 - Physical Chemistry I	3
BIOL 240* - Introduction to Genetics	4	CHEM 370* - Instrumental Analysis I	4
PHYS 131 or 231* - Intro. or Gen. Phys. II	4	CHEM 495 - Seminar in Chemistry	1
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	4
total	17	*total*	15

Senior Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
BIOL 333* - Cell and Molecular Biology	4	CHEM 361 - Principles of Biochemistry	3
Chemistry/Biology elective	3	CHEM 371* - Chemical Dynamics	2
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	4
total	16	*total*	15

* This course has a laboratory component.
** LS = liberal studies course

Updated: 08/27/2011 (CLH)

B.S. in Chemistry, ACS-Certified Concentration
Suggested Course Sequence for 8-semester plan

Freshman Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 139* - General Chemistry I	4	CHEM 140* - Advanced General Chemistry	4
MATH 153 - Calculus I	4	MATH 255 - Calculus II	4
1st yr. seminar or ENGL 101	3	1st yr. seminar or ENGL 101	3
LS** or elective	3	LS or elective	3
total	14	*total*	14

Sophomore Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 232* - Quantitative Analysis	4	CHEM 242 - Organic Chemistry II	3
CHEM 241 - Organic Chemistry I	3	CHEM 272* - Organic Chemistry Lab	2
MATH 256 - Calculus III	4	PHYS 230* - General Physics I	4
LS, elective or ENGL 202	3	LS, elective or ENGL 202	3
		LS or elective	3
total	14	*total*	15

Junior Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 321 - Inorganic Chemistry	3	CHEM 352 - Physical Chemistry I	3
CHEM 380* - Research in Chemistry	2	CHEM 370* - Instrumental Analysis I	4
PHYS 231* - General Physics II	4	CHEM 380* - Research in Chemistry	2
LS or elective	3	CHEM 495 - Seminar in Chemistry	1
LS or elective	3	LS or elective	3
		LS or elective	3
total	15	*total*	16

Senior Year

Fall		Spring	
Course	*Credits*	*Course*	*Credits*
CHEM 435* - Instrumental Analysis II	3	CHEM 361 - Principles of Biochemistry	3
CHEM 453 - Physical Chemistry II	3	CHEM 371* - Chemical Dynamics	2
CHEM 472* - Chemical Syntheses	2	LS or elective	3
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	4
LS or elective	3		
total	17	*total*	15

* This course has a laboratory component.
** LS = liberal studies course

Updated: 08/27/2011 (CLH)

B.S. in Chemistry, ACS-Certified Concentration (4+1 option)
Suggested Course Sequence for 8-semester plan
See catalog for additional guidelines and requirements.

Freshman Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 139* - General Chemistry I	4	CHEM 140* - Advanced General Chemistry	4
MATH 153 - Calculus I	4	MATH 255 - Calculus II	4
1st yr. seminar or ENGL 101	3	1st yr. seminar or ENGL 101	3
LS** or elective	3	LS or elective	3
total	14	*total*	14

Sophomore Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 232* - Quantitative Analysis	4	CHEM 242 - Organic Chemistry II	3
CHEM 241 - Organic Chemistry I	3	CHEM 272* - Organic Chemistry Lab	2
MATH 256 - Calculus III	4	PHYS 230* - General Physics I	4
LS, elective or ENGL 202	3	LS, elective or ENGL 202	3
		LS or elective	3
total	14	*total*	15

Junior Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 321 - Inorganic Chemistry	3	CHEM 352 - Physical Chemistry I	3
CHEM 380* - Research in Chemistry	2	CHEM 370* - Instrumental Analysis I	4
PHYS 231* - General Physics II	4	CHEM 380* - Research in Chemistry	2
LS or elective	3	CHEM 495 - Seminar in Chemistry	1
LS or elective	3	LS or elective	3
		LS or elective	3
total	15	*total*	16

Senior Year

Fall		**Spring**	
Course	*Credits*	*Course*	*Credits*
CHEM 535* - Instrumental Analysis II	3	CHEM 361 - Principles of Biochemistry	3
CHEM 553 - Physical Chemistry II	3	CHEM 371* - Chemical Dynamics	2
CHEM 572* - Chemical Syntheses	2	LS or elective	3
LS or elective	3	LS or elective	3
LS or elective	3	LS or elective	4
LS or elective	3		
total	17	*total*	15

* This course has a laboratory component.
** LS = liberal studies course

Updated: 08/27/2011 (CLH)

For MS 2-year graduation plan, see the MS checksheet on page 42.

C.8 Student transcripts

Student transcripts may be made available upon request.

C.9 Most recent assessment plan

Assessment PLAN and Annual Assessment REPORT, May 2005 - May 2006

(Revised Spring 2006)

Department: **Chemistry and Physics**

Program: **BA** and **BS Degrees** in **Chemistry**

Contact Persons: **Dr. William R. Kwochka** or **Dr. Cynthia Atterholt**

Unit Mission Statement Western Carolina University (WCU) is a regional, comprehensive university within the University Of North Carolina System Of Higher Education. The university's mission is to provide graduate and undergraduate programs in the liberal arts and sciences, business, the applied sciences, and in professional education; to promote excellence in teaching and learning; to support research, scholarly, and creative activities; and to provide service to the western region of the State of North Carolina. Consistent with the university's mission, the **Department of Chemistry & Physics** seeks to provide rigorous classroom education and practical laboratory training of pre-doctoral scientists in the field of chemistry, so that our graduates may be successful in the broad spectrum of professional careers, including medicine, physical therapy, forensics, as well as academic, governmental, and industrial research. In addition, chemistry courses serve undergraduate majors in biology, the health and applied sciences, nursing, natural resources management, and geology. Degrees offered in the department in 2005-2006 include the B.A., the B.S. with a traditional concentration, the B.S. with an environmental concentration, the B.S. with an industrial concentration, the B.S.-ACS (American Chemical Society) approved, the B.S. with a Premedical/Preveterinary/Predental/Preoptometry concentration designed for pre-professional programs, the B.S. with a biotechnology concentration, the B.S. with a forensics concentration, the B.S. Ed in science education with concentrations in chemistry and in physics, and a minor in chemistry. The department also offers a M.S. degree in chemistry, a M.S. in chemistry with an environmental concentration, and a Four-plus-One degree, which is a combined B.S. and M.S. degree that the students complete in five years of study. A new M.S. degree program in Science & Entrepreneurship is being will be added in Fall 2006.

Assessment PLAN

The department of chemistry recognizes the importance of research to both the chemical education of our undergraduates and to the professional development of the faculty. Faculty scholarship is essential for a chemistry faculty member to acquire and maintain their motivation, as well as the tools and the ideas to serve students effectively. Thus, the department strongly encourages (and with the *BS-ACS approved* degree requires) majors to participate in research with faculty and to present their results at regional and national meetings. In addition to the traditional areas of chemical research (such as analytical, biochemistry, inorganic, organic, and physical chemistry), other research themes that faculty in the department have embraced include environmental chemistry and the exciting new fields of biotechnology and forensics.

Program Objectives and Anticipated Outcomes. The overall mission of the department is to provide education and training for pre-doctoral chemists, which allow our graduates to compete and excel in a broad spectrum of professional careers. To achieve our mission, the department has set for itself three broadly defined **objectives**:

> **Objective 1** We aim to teach students the "structure" of modern chemistry; this includes the principles and methods of chemistry and how these are applied to the description of chemical systems and to the solution of chemical problems. This goal is the one most closely tied to the pure classroom **lecture** component of our curriculum, and includes the "book knowledge" that is essential to the practice of chemistry.

Objective 2 We aim to provide practical training for our students in modern laboratory techniques, methods, instrumentation, and data analysis. The laboratory experience should expand upon and reinforce the classroom experience, and provide a modern context for chemical knowledge. The department has several **laboratory** courses that are designed to provide this practical experience in chemistry.

Objective 3 We aim to provide the skills and opportunities necessary for graduates to fuse their classroom and laboratory experiences across the chemistry curriculum, so that they can become scientists, able to self-educate and move intellectually beyond the specifics of what they have learned in our program. Several of the department's upper-level majors (as well as some sophomores and freshman!) participate in undergraduate **research** projects during the academic year and in the summer.

The chemistry department has identified five specific *student-learning* ***outcomes*** associated with the previously described **objectives** that are explained in detail below. *Outcomes Related to Objective 1*: **Outcome 1**. Students will perform competently on national, standardized examinations that are developed and distributed by the ACS. While these standardized exams are certainly not a direct measure of student learning, they provide some indication that the department is focusing on the "right" areas of chemistry. **Outcome 2**. To that end, the department must maintain its approved program status by the ACS so that our curriculum content is objectively assessed, and approved, by the premier professional chemistry society in the world.

Outcomes Related to Objective 2: **Outcome 3**. Students will be able to perform common laboratory techniques competently and be familiar with the operation and applications of *state-of-the-art* scientific instrumentation. **Outcome 4**. Students will be able to record, process, and critically evaluate data obtained in a *modern* laboratory.

Outcomes Related to Objective 3: **Outcome 5**. Students will demonstrate competence in independently gathering, interpreting, and communicating the results of *original* research.

Measures and Criteria. **Outcome 1:** Students will perform competently on national standardized examinations that are developed and distributed by the ACS. These subject-specific standardized examinations are available for the four traditional areas of chemistry: organic, analytical, inorganic, and physical chemistry. At the end of the two-semester organic chemistry sequence (CHEM 241/242), the organic ACS exam is administered as the final exam for the CHEM 242 course. This exam evaluates both semesters of the organic sequence comprehensively. The results of ACS exams administered at WCU are submitted to the education branch of the ACS (now headquartered at the University Wisconsin at Milwaukee), which compiles submissions from all participating schools, establishes national norms, and then reports those norms back to participating schools. The students' scores will be posted, along with the national norms, so that students may rate their own performance against national standards. The department's expectation is that the distribution of our students' scores meets national achievement.

In addition, the appropriate ACS exam is administered as the final examination for the three-semester analytical chemistry sequence (CHEM 232/370/432). The department is considering using ACS exams in the advanced inorganic chemistry (CHEM 321/421) and physical chemistry (CHEM 352/453) courses. However, national participation in these particular subject-specific exams is still quite low and, therefore, national norms for these exams are of limited value. At this time, we feel that the organic chemistry and analytical chemistry ACS exams comprise the best subset of core chemistry courses for nationwide comparison. The curricular content for both of these chemistry sequences is standard and national participation in ACS exams for these subjects is high. **Tenured/tenure-track faculty in the department will review our students' ACS scores and determine, in an ongoing basis, whether or not the results are satisfactory and if the ACS exams are a worthwhile evaluation tool.**

Outcome 2: The ACS approved the chemistry program at WCU in 1994. The department submits annual reports to the ACS's *Committee on Professional Training* and undergoes a five-year comprehensive evaluation, which assesses the department's strengths and weaknesses. In 1999 the department underwent its first comprehensive review; the most recent program review occurred in 2004. **The department submitted an assessment report for a five-year comprehensive review and will act accordingly on any ACS requirements for maintaining *approved program* status.**

Outcomes 3 and 4: Students will be able to perform common laboratory techniques competently, be familiar with the operation and applications of *modern* scientific instrumentation, and be able to record and process data obtained in the laboratory. With the exception of Biochemistry (CHEM 361), Advanced Inorganic Chemistry (CHEM 421), and Chemical Literature Seminar (CHEM 495), every chemistry lecture course required for the major has either a laboratory component integrated into the course, or a companion laboratory course designed to be taken in conjunction with it. These lab-based courses emphasize chemical concepts, proper laboratory technique, operation of modern scientific instrumentation, and appropriate techniques for data handling and analysis. Three courses, Organic Chemistry Lab (CHEM 272), Chemical Dynamics (CHEM 371), and Chemical Syntheses (CHEM 372), focus totally on the laboratory experience; a short discussion provides the background needed to understand the theory of analytical and synthetic techniques, instrument operation, and modern methods of data analysis.

The students' progress in achieving **Outcomes 3** and **4** is assessed both qualitatively and quantitatively by comparing student results either to known values (such as the concentration of a given solution) or to well-established results in chemistry. In Advanced General Chemistry (CHEM 140), for example, students take part in several discovery-based lab experiments. One example of this type of experiment is known as the "coffee-pot lab". The problem is to develop a method for measuring the temperature of a pot of hot water with only a 40^{o}C thermometer. Students work in pairs and must show initiative by designing a strategy for determining the temperature. In CHEM 432, the Instrumental Analysis II course, another "unknown" lab involves the measurement of mercury concentrations in water samples using Atomic Absorption/Inductively Coupled Plasma spectroscopy. Students are graded against the known precision of the techniques and instrumentation involved, which permits an objective assessment of student accomplishment. A student has succeeded if his or her results are correct to within the precision allowed by the method. **The faculty will review the relevance and effectiveness of our laboratory exercises and evaluate whether the total laboratory program forms a rational and coherent program. In addition, the faculty will continually evaluate the status of instrumentation and equipment in the teaching laboratories.**

Outcome 5: Students will demonstrate competence in independently gathering, interpreting, and communicating the results of modern chemical research. Student success will be measured using our Chemical Literature Seminar (CHEM 495) and by student progress in conducting and reporting original chemical research. CHEM 495 is a one-semester course that requires students to master techniques for searching and using the literature of published chemical research, to select a topic in current chemical research, and to give a written and oral presentation of this research topic to the class. Students actively involved in research within the department often choose to present their own work. In addition, students are required to attend seminars presented by visiting scientists from academic, industrial, and governmental laboratories on current chemical research. The purpose of these seminars is for students to learn about "cutting edge" chemistry and to learn how research is presented to a professional audience.

The ultimate learning opportunity for our students, however, is to participate in an undergraduate research project. Many of our majors enroll in the Research in Chemistry course (CHEM 380) with one or more of our faculty. The faculty, therefore, have excellent opportunities to observe how our students perform in unstructured laboratory situations which demand resourcefulness and creativity. While this type of evaluation is subjective, an anecdotal assessment of the capabilities of students with whom they work is very valuable. The ultimate measure of research success, however, is established by the professional scientific community (in this case the ACS) and is the same for all scientists: publication of articles in international, peer-reviewed journals and presentation of results at regional or national scientific meetings. **The faculty will share their perceptions of the scientific maturity demonstrated by our students and in the overall research effort of the department. The faculty will also evaluate the department's ability to support undergraduate research. Methods for addressing perceived weaknesses in our students will be discussed as will the status of resources available to our students and faculty.**

2005/2006 Assessment REPORT

As of May 7, 2006, the chemistry department graduated 15 chemistry BA/BS students for the 2005/2006 academic year. The table below reflects the steady growth that the department has experienced during the last six years. To date there are 120 continuing BA/BS students and 4 continuing BS ED students in the chemistry department; the department does not track the number of chemistry minors.

Academic year	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005	2005/2006
# of graduates	6	15	12	14	18	15

Outcome 1: Recently, scores on the Organic ACS exam have averaged around the 40th percentile. The department generally has a few outstanding students which score in the 60-80th percentile range. It should be noted that of the students that take the Organic ACS exam every year, approximately 33% were chemistry majors. In the spring of 2003 the ACS organic chemistry exam was a trial version, thus no statistical was available

On the Analytical ACS exam, students typically perform better with the class average in the mid-40th percentile. *The Organic ACS exam was not used at the end of the CHEM 241/242 sequence in the spring 2005 semester because it was felt that no useful information was being gleaned from these examinations. Upon compilation of the data, however, we are encouraged to see an "uphill" trend in the scores for the Organic ACS exam. In the next241/242 sequence we will reinstitute using the Organic ACS exam as the final exam in CHEM 242.*

Course	Average raw score for exam Out of 70 for Organic Out of 75 for Analytical	National percentile
Organic – ***Spring 2005***	ACS exam not given	N/A

Organic – Spring 2004	28.3	39
Organic – Spring 2003	25.4	N/A
Organic – Fall 2002	28.0	17
Organic – Spring 2002	26.0	11
Analytical – ***Spring 2005***		
Analytical – Spring 2004	32.0	43
Analytical – Spring 2002	26.4	40

Outcome 2: Findings in the 1999 ACS Committee on Professional Training (CPT) five-year assessment report (the results of which we received in February 2001) commend the department for its reorganization of our introductory chemistry classes and its success in obtaining grants to purchase instrumentation. However, there were several points about our program that the committee wanted addressed. The first item that the ACS-CPT queried was the lack of an inorganic chemistry laboratory component in CHEM 372, Synthesis. *For the past few years this course was team team-taught by an organic chemist and an inorganic chemist; the result of which was an increase in the level of sophistication of the inorganic chemistry experiments that meet the criteria set forth by the ACS-CPT. The department believes that this curricular concern has been properly addressed.*

The second item the ACS-CPT wanted addressed was the lack of adequate ventilation in the freshman labs (located in Stillwell Building), the organic lab, and, perhaps most noticeably, in the Natural Sciences Building stockroom. Blowers for the fume hoods in the labs were not up to code and the laboratory was considered unsafe. Since that time the problem has been partially addressed. *This situation still remains a problem in the Natural Sciences Building (NSB), but we are confident that with the imminent renovation of Stillwell Building some of the problems in the chemistry* ***teaching*** *labs will be addressed. All of the introductory chemistry laboratory and organic chemistry laboratory courses will be taught in the newly renovated Stillwell Building. These facilities will bring Western Carolina University's science programs into the 21st century and will make a significant pedagogical impact. We will be able to offer our students a more stimulating arena for learning as well as a much safer working environment.*

Many faculty in the department (along with the biology and physics programs) maintain ***undergraduate research*** *labs in NSB and Stillwell. There remain some concerns about the adequacy of good hood space in NSB as well as other aspects of safety. Perhaps in the upcoming years these safety concerns will be addressed in the Natural Sciences Building.*

The third concern related to written reports prepared by students performing undergraduate research (CHEM 380). The ACS-CPT stated that for an upper-level course that is required for graduation, CHEM 380 must contain a rigorous writing component. In particular, the ACS-CPT wanted the chemistry department to develop uniform guidelines that require more than initial drafts to be prepared with faculty review and revision at each stage. *The department has developed guidelines that it will implement a syllabus (including writing requirements) for the CHEM 380 course. In addition, we are developing a similar syllabus for students enrolled in our graduate program. Likewise, the department will begin discussions this fall about how to organize the writing component of our laboratory curriculum; our plan is to establish a more coherent writing program throughout the chemistry program.*

Another item that the ACS-CPT reviewed was the chemistry department's request for approval for the environmental chemistry program. In the department's proposal for the new program, the ACS-CPT felt that too many courses were removed from the core set of chemistry courses; more of a balance is needed in order for the program to be approved. *The department has not pursued external approval (from ACS-CPT) for the environmental chemistry program at Western Carolina University; it was felt that the resources (both personnel and facilities) were not yet available to meet the criteria for the approved program. The University, however, has approved the department's request for implementing a BS in chemistry with an environmental concentration and we see this program as, among other things, a way of addressing the needs of the region, the mission of the university, and as a recruitment tool for both undergraduate and graduate students. Professor Cynthia Atterholt serves as the coordinator for the Environmental Sciences program.*

After studying the syllabi of chemistry courses offered in the chemistry department, the ACS-CPT determined that three of the courses (CHEM 330, CHEM 361, and CHEM 461) were considered marginal as advanced courses. *The department has made significant changes to two of the three courses mentioned in the ACS-CPT report; while we agreed that adjustments needed to be made for the CHEM 330 and CHEM 461 courses, the department disagreed with the ACS-CPT findings that CHEM 361 (Biochemistry) needed revision and thus the curriculum was left intact. The CHEM 330 course (Aquatic Chemistry, which has a lecture and laboratory component, was designed with Natural Resource Management and Environmental Health majors in mind. Although our chemistry majors are permitted to enroll in the lecture portion of the course, they can no longer participate in the laboratory portion because the laboratory curriculum too closely parallels the analytical chemistry curriculum.*

As for CHEM 461 (Environmental Chemistry), this course now has a separate laboratory and lecture components; CHEM 461 continues to be the lecture component of the course. The laboratory portion of the course, however, has been replaced by the laboratory compliment to CHEM 461, which is now CHEM 470, Advanced Instrumental Analysis Laboratory. The general consensus was that separating the lecture from the lab would make both facets of this course more rigorous.

Through discussions with students and faculty in the biology department, it became apparent that there is a desire for a laboratory component for the biochemistry course, CHEM 361. Thus, with the addition of a new faculty member (a biochemist who started in fall 2005), the department will begin planning a biochemistry laboratory component to CHEM 361 or a standalone biochemistry laboratory course.

One aspect of ACS approved program status not mentioned in the 1999 report, are the recommended holdings of periodicals in Hunter Library. In the past several years, periodical subscriptions in the chemical sciences have been cut 60 – 70%. The ACS-CPT requires a minimum subscription list of 14 of the recommended journals in order to maintain approved program status. *Needless to say, this trend is quite alarming; the department, and the university as a whole, cannot withstand more budget cuts and continue to offer our students a quality education. While the actual holdings in the library have decreased, within the last year or two the library has made it a priority to provide the faculty and students with access to chemical databases (such as SciFinder Scholar) which may actually provide us with greater access to the chemical literature. Most of the chemistry periodicals that Hunter Library subscribes to are now available to faculty electronically via their office, and sometimes, home computers.*

Outcomes 3 and 4: Review of curricular matters in the Department of Chemistry is an ongoing process and there have been some significant changes recently. *A much-needed adjustment to the curriculum in chemistry was to reduce the total number of hours in the major required for obtaining a BA/BS in chemistry. The department also introduced a "4 + 1 BS/MS" program in chemistry in which an undergraduate may obtain both BS and MS degrees in chemistry in 5 years. The department is developing a forensic chemistry concentration (a tenure-track forensic/analytical chemist began fall 2005) and introduced its first forensic chemistry course as a special topics course (CHEM 493) in the fall 2005 semester. Review of curricular matters is an ongoing process and occurs both in informal, impromptu "meetings in the hall" and in formal departmental meetings.*

Likewise, the department continually strives to acquire state-of-the-art instrumentation to provide better opportunities for our students and faculty. *The department has purchased, with funding provided by Western Carolina University, several pieces of research instrumentation for chemistry and biotechnology teaching and research. Among the recently purchased instrumentation are an ion-trap mass spectrometer, an infrared microscope, and an automated DNA sequencer. In addition, the department now possesses a microwave synthesis unit for both pedagogical and research purposes. Few chemistry departments at primarily undergraduate institutions (PUI's) can match the breadth and quality of research instrumentation available at Western Carolina University. To maintain our high standard of instrumentation the department recently hired an instrumentation specialist (non-tenure track) to assist with faculty and student needs (fall 2005).*

Outcome 5: As always, research plays an important role in pedagogical aspects of the department and all members of the chemistry department are actively engaged in research with undergraduates. *In addition to several students doing research at Western during the academic year, we have also had students conduct research during the summer at the University of Arkansas, doing research sponsored by the National Science Foundation. Some of these undergraduate researchers have presented their findings at the National Conference on Undergraduate Research. Other undergraduates have done presentations at professional meetings such as the annual South East Regional Meeting of the American Chemical Society and the Pittsburgh Conference. In addition, some of these students also presented posters at a poster session in Raleigh, NC, for the benefit of our state legislators.*

One measure of the success of our program is what our majors do after they graduate from Western. Chemistry students that have graduated this past academic year have been accepted into graduate programs in chemistry at the University of Arizona, North Carolina State University, Duke University, Wake Forest University, the University of North Carolina at Charlotte, and Western Carolina University. Several other students have been accepted into professional programs such as pharmacy school and chiropractic school. Recent chemistry graduates are currently enrolled in Ph.D. programs at North Carolina State University, Virginia Tech, the University of South Carolina (2), Clemson (2), the University of Arizona, and Georgia Tech. Several other graduates have found jobs in industry and working for the federal government (the Centers for Disease Control in Atlanta).

Overall Assessment of the Program in the Department of Chemistry

The Department of Chemistry at Western Carolina University has undergone dramatic change in the past few years; as the university is growing, so is the department. The number of majors in the department has increased and we have added faculty and staff. While environmental chemistry and biotechnology remain the two major research themes within the department, a forensic chemistry emphasis was added to departmental offerings in the fall 2005, as will an entrepreneurial science program housed in the department (Master of Science & Entrepreneurship).

Our students have benefited tremendously from faculty pursuing research programs in these areas. Students who have actively pursued research projects have had their research published in peer-reviewed journals and presented their findings at national and regional scientific meetings. In support of this level of research, the department has done a wonderful job of providing state-of-the-art instrumentation to students to work on significant scientific problems.

The chemistry department has taken an active role in reviewing its curriculum, has actively engaged students in undergraduate research, and has maintained strong ties with the public schools in the community. We are proud of our role and record in educating undergraduates and providing opportunities for them to do chemistry beyond the classroom. We look forward to another exciting year of working with undergraduates.

C.10 Annual assessment reports for the previous five years

Western Carolina University
B.A./B.S./M.S. in Chemistry
Department of Chemistry and Physics
College of Arts and Sciences
Annual Assessment Report for 2006-2007

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Student Learning Outcome(s) Assessed in 2006-07	Method(s) of Assessment	Results of Assessment	Implementation Plan
Independently gather, interpret, and communicate the results of original research. (B.A./B.S./M.S.)	Research at WCU -CHEM 380 (B.S.) -CHEM 698 (M.S.)	23 students were enrolled in the undergraduate course CHEM 380, Research in Chemistry, for one or more semesters since summer of 2006: Matthew Alexander, Kyle Beard, D. Michelle Benoist, Laura Cleveland, Erin Hinson, Seth Holling, Peter Hughes, Christian Jensen, Kelly Lawrence, Emily Love, Kevin Macdonald, Jessica May, Tyler Melton, Michael Moore, Roger Outlaw, Rio Patterson, Rachel Reilly, Candice Roberts, Erika Sesti, Benjamin Sims, Heidi Sinz, Jessica Walsh, and Erin Waugh. 13 students were enrolled in the graduate course CHEM 698, Research in Chemistry, for one or more semesters since summer of 2006: Stephen Ballew, Brittania Bintz, Wesley Bintz, Januka Budhathoki, Youngsoo Cho, Paul Davis, Edward Gonzalez, Malia Gonzalez, Kelly Lawrence, Richard Ritter, Rajendra Uprety, and Michael Young.	We are very pleased with the number of students participating in chemistry research with a faculty advisor. In particular, the number of graduate students pursuing independent research accounts for about 20% of our chemistry majors. Future goals are to increase the number of participants even more, to get students involved in research earlier in their academic career, and to encourage students to pursue their research projects for at least two semesters.
Independently gather, interpret, and communicate the results of original research. (B.A./B.S./M.S.), cont.	Research at Other Universities	Several students participated in an NSF funded Research Experience for Undergraduates in the summer of 2007. These students are involved in research projects at other universities: Stephanie Harper and Stephanie Rockett (West Virginia University), Katie Blumsack (Louisiana State University), and Laura Cleveland and Karla Wright (University of Wyoming).	Pursuing research at other institutions is a great way for students to learn more about areas of chemistry that are not studied at WCU. We plan to encourage more students to apply for such opportunities in the future. We are also applying for funding to host students from other institutions at WCU in summer of 2008.

	Seminar -CHEM 496 (B.S.) -CHEM 696 (M.S.)	This year 14 students were enrolled in the undergraduate course CHEM 495, Seminar, and each semester an average of 9 students were enrolled in the graduate course CHEM 696, Seminar. In this course students were required to give oral and poster presentations of their research.	Each of these courses has been taught by new instructors this year, and great emphasis has been put on developing communication skills by including more presentations and discussions of research results and interpretations.
	Internal Presentations	Graduate students Stephen Ballew and Youngsoo Cho presented their research at the Graduate Research Symposium at WCU.	Internal presentations are a way to introduce the successes of the Department of Chemistry and Physics to other departments of WCU. We will continue to encourage our students to participate in these symposia.
	External Presentations	Undergraduate student Amy Cagle presented a poster at the National Conference of the Council on Undergraduate Research. Undergraduate student Carmen Batchelor presented a poster at the National Conference of the Council on Undergraduate Research. Undergraduate student Carmen Batchelor presented a poster at a meeting in Raleigh, NC. Undergraduate student Kelly Lawrence presented a poster at the National Meeting of the American Chemical Society.	External presentations are perhaps the best way to develop communication skills and to share the results of research with the scientific community. We will continue to pursue this mechanism of dissemination. However, travel to conferences continues to be challenging, mostly because of scheduling conflicts for both students and professors. Fortunately, funding for such trips has been adequate.

Independently gather, interpret, and communicate the results of original research. (B.A./B.S./M.S.), cont.	External Presentations, cont.	The research of undergraduate student D. Michelle Benoist was presented at the international conference of the American Society for Mass Spectrometry. The research of undergraduate students Joseph Baker, Jamie Jones, and Christopher Wilson was presented at the Southeast Regional Meeting of the American Chemical Society. The research of undergraduate student Amy Cagle was presented orally at the Southeast Regional Meeting of the American Chemical Society. The research of graduate students Catherine Garrison, Michael Young, and Wesley Whitfiled was presented at the Southeast Regional Meeting of the American Chemical Society. The research of graduate students Januka Budhathoki and Rajendra Uprety was presented orally at the Southeast Regional Meeting of the American Chemical Society. The research of graduate students Januka Budhathoki and Rajendra Uprety was presented as a poster at a Gordon Research Conference.	See comments above…
	Publications	In 2006, the work of student Alisha Pendergrass and faculty member David Butcher was published in a scientific journal. An article was also submitted from Brian Dinkelmeyer's research group but will require editing before it is accepted. Other research groups involving students have articles in preparation.	We are extremely pleased to have some publications this year. Of course we will continue to strive towards an increased number of publications. However, faculty teaching loads are somewhat prohibitive.
Complete a thesis that demonstrates the ability to create and interpret research results specific to the field of study thereby advancing the state of disciplinary knowledge. (M.S.)	Thesis and Research Advisory Committee Meetings	Each graduate student is required to meet with their advisory committee once per semester. An oral presentation of completed research is given, and feedback from the advisory committee is provided.	While such committee meetings have always been a part of the curriculum for graduate students, meeting biannually was not enforced until recently. These meetings are now enforced through the graduate seminar course, CHEM 696, and are designed to keep students on track to graduating in a timely fashion. Require students to present their work one or more times per semester has encouraged students to complete their research so that they have data to present. Therefore the meetings are serving their purpose.

	Thesis Proposal	Each graduate student must prepare a written document describing their research plans for the M.S. degree before the end of his or her second semester. Students submitting thesis proposals this year include Stephen Ballew, Januka Budhathoki, Paul Davis, Malia Gonzalez, Rajendra Uprety, and Michael Young.	The thesis proposal helps to direct the research of our students. It also serves to enhance their written communication skills, and give them experience with finding and reading about current research published in the scientific literature.
	Thesis	Each graduate student must write and defend a thesis which describes his or her research results and interpretations. Students completing the thesis this year include Brittania Bintz, Youngsoo Cho, Mark Clark, and Catherine Garrison.	The thesis describes a student's research by providing data, interpretations of the data, and meaningful scientific conclusions. Many theses have focused more on data collection techniques and the data itself than on the interpretations of data and meaningful scientific conclusions. Our goal is to encourage students to shift the focus toward the interpretation of results because this will make them better scientists.

Western Carolina University
B.A./B.S./M.S. in Chemistry
Department of Chemistry and Physics
College of Arts and Sciences
Annual Assessment Report for 2007-2008

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Student Learning Outcome(s) Assessed in 2006-07	Method(s) of Assessment	Results of Assessment	Implementation Plan
Independently gather, interpret, and communicate the results of original research. (B.A./B.S./M.S.)	Research at WCU -CHEM 380 (B.S.) -CHEM 698 (M.S.)	23 students were enrolled in the undergraduate course **CHEM 380: Research in Chemistry** for one or more semesters since summer of 2007: Megan Arrington, Dara Atkison, Samuel Birchfield, Katie Blumsack, Jacklyn Bush, Laura Cleveland, Andrew Duncan, Brian Harding, Stephanie Harper, Ben Hart, Madeline Hill, Alisha Hunter, Collin Jones, Emily Love, Jeffrey Lux, Tyler Melton, Michael Moore, Emily Nantz, David Rice, Candice Roberts, Isaac Roberts, Michael Wilhelm, Timothy Willis. 13 students are currently enrolled for **CHEM380** in Fall 2008: Jacklyn Bush, Andrew Duncan, Sara Garrett, Madeline Hill, Alisha Hunter, Collin Jones, Barry McNeely, Susan Middleton, David Rice, Brian Sneed, Jessica Spear, Timothy Willis, and Lucas Wilson. 14 students were enrolled in the graduate course **CHEM 698: Research in Chemistry** for one or more semesters since summer of 2007: Alfred Appiah, Stephen Ballew, Kyle Beard, Michelle Benoist, Chad Brooks, Januka Budhathoki, Paul Davis, Malia Gonzalez, Kelly Lawrence, Sung-Gun Park, Rajendra Uprety, Jesse Walsh, Shana Weathersby and Michael Young.	We are very pleased with the number of students participating in chemistry research with a faculty advisor. In particular, the number of graduate students pursuing independent research accounts for about 20% of our chemistry majors. Future goals are to increase the number of participants even more, to get students involved in research earlier in their academic career, and to encourage students to pursue their research projects for at least two semesters.

Independently gather, interpret, and communicate the results of original research. (B.A./B.S./M.S.), cont.	Research at Other Universities	Several students participated in an NSF funded Research Experience for Undergraduates in the summer of 2007. These students are involved in research projects at other universities: Stephanie Harper and Stephanie Rockett (West Virginia University), Katie Blumsack (Louisiana State University), and Laura Cleveland and Karla Wright (University of Wyoming).	Pursuing research at other institutions is a great way for students to learn more about areas of chemistry that are not studied at WCU. We plan to encourage more students to apply for such opportunities in the future. We are also applying for funding to host students from other institutions at WCU in summer of 2008.
	Seminar -CHEM 496 (B.S.) -CHEM 696 (M.S.)	This year 24 students were enrolled in the undergraduate course **CHEM 495: Seminar**, and each semester an average of 11 students were enrolled in the graduate course **CHEM 696: Seminar**. In this course students were required to give oral and poster presentations of their research.	Each of these courses has been taught by new instructors this year, and great emphasis has been put on developing communication skills by including more presentations and discussions of research results and interpretations.
	Internal Presentations	Graduate students D. Michelle Benoist, Kyle Beard and Kelly Lawrence presented their research at the Graduate Research Symposium at WCU.	Internal presentations are a way to introduce the successes of the Department of Chemistry and Physics to other departments of WCU. We will continue to encourage our students to participate in these symposia.
	External Presentations	Undergraduate students Erika Sesti, Erin Hinson, Laura Cleveland, Katie Blumsack Kyle Beard presented their research as posters at the Southeast Regional Meeting of the American Chemical Society. Undergraduate students Alisha Hunter and Katie Blumsack presented their research orally at the National Council on Undergraduate Research. The research of undergraduate student Erika Sesti was presented orally at the Pittsburg Conference and as a poster at the Southeast Regional Meeting of the American Chemical Society. Undergraduate student Kelly Lawrence presented a poster at the National Meeting of the American Chemical Society.	External presentations are perhaps the best way to develop communication skills and to share the results of research with the scientific community. We will continue to pursue this mechanism of dissemination. However, travel to conferences continues to be challenging, mostly because of scheduling conflicts for both students and professors. Fortunately, funding for such trips has been adequate.

Independently gather, interpret, and communicate the results of original research. (B.A./B.S./M.S.), cont.	External Presentations, cont.	The research of undergraduate student D. Michelle Benoist was presented at the international conference of the American Society for Mass Spectrometry. The research of undergraduate students Joseph Baker, Jamie Jones, and Christopher Wilson was presented at the 2007 Southeast Regional Meeting of the American Chemical Society. A number of undergraduate researchers presented their research as posters at the 2007 Southeast Regional Meeting of the American Chemical Society: Erika Sesti, Erin Hinson, Laura Cleveland and Katie Blumsack. A number of M.S. researchers presented their research as posters at the 2007 Southeast Regional Meeting of the American Chemical Society: Kyle Beard, Januka Budhathoki, Rejendra Uprety. The research of graduate students Januka Budhathoki and Rajendra Uprety was presented orally at the Southeast Regional Meeting of the American Chemical Society.	See comments above…
	Publications	In 2008, the research of undergraduate students Joseph Baker, Christopher Wilson and Jamie Jones and faculty member Jack Summers was published in the *Journal of the American Chemical Society*. In 2007, the research of M.S. students Wesley Bintz and faculty member David Butcher was published in *Microchemical Journal.* In 2007, the research of M.S. students Patrick Baldwin and faculty member David Butcher was published in *Microchemical Journal.* Other research groups involving students have articles in preparation.	We are extremely pleased to have some publications this year. Of course we will continue to strive towards an increased number of publications. However, faculty teaching loads are somewhat prohibitive.

Complete a thesis that demonstrates the ability to create and interpret research results specific to the field of study thereby advancing the state of disciplinary knowledge. (M.S.)	Thesis and Research Advisory Committee Meetings	Each graduate student is required to meet with their advisory committee once per semester. An oral presentation of completed research is given, and feedback from the advisory committee is provided.	While such committee meetings have always been a part of the curriculum for graduate students, meeting biannually was not enforced until recently. These meetings are now enforced through the graduate seminar course, CHEM 696, and are designed to keep students on track to graduating in a timely fashion. Require students to present their work one or more times per semester has encouraged students to complete their research so that they have data to present. Therefore the meetings are serving their purpose.
	Thesis Proposal	Each graduate student must prepare a written document describing their research plans for the M.S. degree before the end of his or her second semester. Students submitting thesis proposals this year include D. Michelle Benoist, Kelly Lawrence, Shana Weathersby and Kyle Beard	The thesis proposal helps to direct the research of our students. It also serves to enhance their written communication skills, and give them experience with finding and reading about current research published in the scientific literature.
	Thesis	Each graduate student must write and defend a thesis which describes his or her research results and interpretations. Students completing the thesis this year include: R. Lee Ritter, D. Michelle Benoist, Kyle Beard, Michael Young, Rajendra Uprety, Januka Budhathoki, and James Bollick.	The thesis describes a student's research by providing data, interpretations of the data, and meaningful scientific conclusions. Many theses have focused more on data collection techniques and the data itself than on the interpretations of data and meaningful scientific conclusions. Our goal is to encourage students to shift the focus toward the interpretation of results because this will make them better scientists.

Western Carolina University
Chemistry B.A./B.S.
Department of Chemistry and Physics
College of Arts and Sciences
Annual Assessment Report for 2008-2009

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Student Learning Outcome 1: Articulate the principles and methods of chemistry.

- Method of Assessment
  This outcome is assessed in CHEM 495 (seminar) where students were asked to debate current, controversial topics including global warming, the greenhouse effect, and stem cell research to practice expressing scientific topics. Their performance in the debate is a measure of their ability to articulate the principles and methods of chemistry.
- Results of Assessment
  Students were not as successful as we had hoped in articulating the scientific findings to back their assigned viewpoint. Generally speaking, they were at a loss in defending a viewpoint that was not in alignment with their personal feelings. However, when their assigned viewpoint and their personal feelings were aligned, students were able to find large amounts of supporting scientific data and successfully defended their perspective. We also noted that students were unable to stay focused on particular aspects of the debate. In other words, comments from opposing sides did not always relate.
- Implementation Plan
  We plan to try this method again next year, but we will provide more narrow topics for discussion. For example, we will assign a particular aspect about the green house effect (such as the contribution from industrial plants) so that students will be more focused in the debate. We will also try to pair students according to their personal beliefs (either for or against an issue), so that they will be more evenly matched. Our hope is that students will be able to stay focused on the discussion and present their viewpoint clearly.

Student Learning Outcome 2: Apply the principles and methods of chemistry to the description of chemical systems and to the solution of chemical problems.

- Method of Assessment
  This outcome is assessed in CHEM 371 (chemical dynamics) where students are assigned independent projects. In these projects, students are given a particular problem to solve (e.g. determine the equilibrium constant for a chemical reaction) and must develop a method to solve this problem. Then, they perform and experiment and interpret the results. Finally, they present their project to the class. Their performance in each of these tasks is an assessment of their abilities to apply their chemical knowledge to solving a chemical problem.
- Results of Assessment
  Generally speaking, students found method development to be challenging, but were successful overall in coming up with a method to solve their problem. Students did an excellent job of performing their experiments. While some groups need help with their data analysis, most groups were able to interpret their results independently. All students did an excellent job of presenting their projects. One issue that arose is that students don't have a lot of time to devote to this project since the project comes at the end of the semester.
- Implementation Plan
  In future semesters, this project will be assigned near the middle of the semester so that students are able to complete their projects in a more timely fashion without feeling overwhelmed. This scheduling change should improve the results.

Western Carolina University
M.S./4+1 in Chemistry
Department of Chemistry and Physics
College of Arts and Sciences
Annual Assessment Report for 2008-2009

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Program Goals:

1. Teach students the structure of modern chemistry.
2. Provide practical training for our students in modern laboratory techniques, methods, instrumentation and data analysis. The laboratory experience should expand upon and reinforce the classroom experience and provide modern context for chemical knowledge.
3. Provide the skills and opportunities necessary for graduates to fuse their classroom and laboratory experiences across the chemistry curriculum, so that they can become scientists, able to self-educate and move intellectually beyond the specifics of what they have learned in the world.
4. Maintain approved program status by the ACS so that our curriculum content is approved by the premier professional chemistry society in the world.

Student Learning Outcomes:

1. Articulate the principles and methods of chemistry.
2. Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.
3. Perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation.
4. Record, process and critically evaluate data obtained in a modern laboratory.
5. Independently gather, interpret and communicate the results of original research.

Student Learning Outcome(s) Assessed in 2008-09	Method(s) of Assessment	Results of Assessment	Implementation Plan
Outcome 3: Perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation. **Outcome 5:** Independently gather, interpret, and communicate the results of original research.	**CHEM698:** Independent research is a requirement of our program.	*utilizing state-of-the-art scientific instrumentation:* Students use state-of-the-art instrumentation in pursuing their individual projects and gain mastery in their operation use and maintenance. *Independently gather/interpret original research:* Students work independently on their research projects. 16 students were enrolled in the graduate course **CHEM 698: Research in Chemistry** for one or more semesters since summer of 2008: Megan Arrington, Katie Blumsack, Mathew Flood, Yasemin Hakat, Ben Hart, Alisha Hunter, Collin Jones, Jonathan Markley, Michael Moore, Sung-gun Park, Isaac Roberts, Matthew Rosenberg, Shana Weathersby, Lucas Wilson and Terryol Willson	We will continue with this practice.
Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory. ***Outcome 5:*** Independently gather, interpret, and communicate the results of original research	**CHEM699:** Thesis. A written thesis and oral defense is a requirement of our program. The thesis describes a student's research by providing data, interpretations of the data, and meaningful scientific conclusions.	*Independently gather, interpret, and communicate the results of original research:* Students completing their thesis this year include: Paul Davis, Sung-Gun Park, Jesse Walsh, Mike Young, Kyle Beard, James Bollick, Malia Gonzalez and Lee Ritter. Many theses have focused more on data collection techniques and the data itself than on the interpretations of data and meaningful scientific conclusions. Our goal is to encourage students to shift the focus toward the interpretation of results because this will make them better scientists.	We will continue with this practice. Faculty and committees have/are becoming more demanding in their expectations in regard to data analysis in the written thesis and the oral defenses.
Outcome 1: Articulate the principles and methods of chemistry. **Outcome 2:** Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.	**Thesis Proposal:** Each graduate student is required to prepare a written document describing their research plans for the M.S. degree before their second semester	In the recent past we have had some students submitting research plans late in their graduate career. We are addressing the issue by providing greater oversight of students progress in CHEM696:Seminar and CHEM 593: Research Methods courses Students submitting thesis proposals this year include Michael Moore, Jonathan Markley, Megan Arrington, Matthew Rosenberg and Ralph Patterson.-	We are enforcing the research prospectus requirement in CHEM696 seminar and is a course requirement for students enrolled in CHEM596: Research methods. We are also considering on including the research prospectus as part of the formal application process for the 4+1 MS students.

Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory. **Outcome 5:** Independently gather, interpret, and communicate the results of original research.	MS students are required to be enrolled in the graduate course **CHEM 696: Seminar**. Students are required to: a) give oral presentations on their research. b) attend seminars from invited speakers and must read the most recent literature published by the external speakers. c) submit weekly research progress forms. These require consultation with their research advisors who must sign and date the forms.	a) *Communicate results of original research:* Students gained experience communicating the results of independent research. a/b) *critically evaluate data:* Students have gained experience evaluating research quality and identifying/overcoming potential difficulties in their research. c) *Independently gather/critically evaluate/interpret data:* This practice insures students are actively gathering data and learning methods of interpretation and data analysis from their faculty mentor.	We will continue requiring students to review current literature and submit research progress reports. Emphasis has been put on developing communication skills by including more presentations and discussions of research results and interpretations.
Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory. **Outcome 5:** Independently gather, interpret, and communicate the results of original research.	**Research Methods** CHEM 593 This is a new course offered in the fall '08 semester and was aimed at 1st and 2nd semester MS students and 4+1 students. Course content includes: a) methods of searching the chemical literature. b) literature searches pertinent to individual research projects. c) prospectus and presentations prepared from primary sources of literature.	*Gather, interpret, and communicate the results of original research*: Items a)-c) address this learning outcome. Completion of the research prospectus is a requirement of this course. This appears to be helping MS candidates progress toward their degree with greater efficiency. Feed back from students was very positive and they recommended that the class be taken by all incoming MS students.	Greater emphasis is being put on searching, reading and understanding current literature as it pertains to individual research projects. The course will be offered again in the upcoming year.
Outcome 5: Independently gather, interpret, and communicate the results of original research.	Publications	In 2008, the research of undergraduate students Joseph Baker, Christopher Wilson and Jamie Jones and faculty member Jack Summers was published in the *Journal of the American Chemical Society*. Other research groups involving students have articles in preparation.	We are extremely pleased to have some publications this year. Of course we will continue to strive towards an increased number of publications. However, faculty teaching loads are somewhat prohibitive.

	Thesis and Research Advisory Committee Meetings Each graduate student is required to meet with their advisory committee once per semester. An oral presentation of completed research is given, and feedback from the advisory committee is provided. The meetings are designed to keep students on track to graduating in a timely fashion. Require students to present their work one or more times per semester has encouraged students to complete their research so that they have data to present. Therefore the meetings are serving their purpose.	While such committee meetings have always been a part of the curriculum, meeting biannually was been difficult to enforce. Efforts to enforce this requirement in seminar (CHEM698) and research methods (CHEM593) have been difficult. The scheduling of the meeting has been a student responsibility. Students often wait until the end of the semester to schedule when it is difficult to find a time when all faculty committee members can meet.	Our research faculty will be discussing possible solutions the issue in the fall One solution is to have meeting dates assigned to the students rather then holding them responsible for scheduling.
Program Goal #2: ***Provide practical training for our students in modern laboratory techniques, methods, instrumentation and data analysis***	One measure of our programs success is where our MS candidates go after leaving WCU.	Kyle Beard. 2008: PhD program University of Georgia Mike Young 2008: PhD Program University of California at Riverside Sung-Gun Park 2009: PhD Program Louisiana State University Michelle Benoist 2009: PhD Program University of Alabama at Auburn.	In the past we have done a poor job of tracking students after they have left WCU. We will be making greater effort to track students so that we gauge how well our program is preparing graduates for the job market and terminal degree programs.

OTHER

In the fall of 2005 the MS program in chemistry underwent an external review. The report described five recommendations to improve upon the MS program in chemistry at Western Carolina University. A recurrent theme in each of the five recommendations is individualized teaching in the form of original research projects.

Below is a list of the recommendations along with the chemistry department's suggestions for addressing these recommendations. Some needs have been addressed since the external review in 20005. Namely, there has been a decreased teaching load for faculty mentoring student research (item 2). Awarding credit in terms of contact hours for faculty mentoring students has not been met (item 1). However, faculty are at least modestly compensated for CHEM 380/698 during the summer session. There has also been some increase in research/hood space since the opening of the renovated science wing of the Stillwell Building (item 5).

1. **Award credit for faculty mentoring student research in CHEM 380 and CHEM 698.** The reviewers made no suggestion as to how faculty could receive credit in their teaching load by engaging students in research. Thus, a quick survey of other chemistry departments in the country, particularly the University of Texas system, provided the groundwork for such assessment. The

chemistry department proposes to provide credit in their standard 12 credit hour teaching load for involvement in research with students using the following formula:

(# of students engaged in research) x (# of credit hour for CHEM 380) x 0.3 = # credit hours toward the standard teaching load

For example, if a faculty member is working with 5 undergraduates in CHEM 380, which is a 2 credit hour lab course, then that faculty member is eligible for 5 students x 2 credit hours x 0.3 = 3 credit hours (or one lecture course) allocated toward their teaching load for a semester.

2. **Decrease teaching load of faculty members.** The reviewers made no suggestion as to how faculty could receive credit in their teaching load by engaging students

3. **Increase startup funding for faculty.** The current level of startup funding ($16,000 over 2 years) is not competitive with our peer institutions and has, in part, resulted in highly qualified applicants turning down offers of employment. The chemistry department recommends that startup funding for faculty be increased to at least $40,000 to be distributed over 2 years. This amount is consistent with awards of starter grants from the Petroleum Research Fund of the American Chemical Society. Incidentally, $40,000 startup was the amount provided to a faculty member hired in 1996.

4. **Increase GA stipends and tuition waivers.** Currently graduate assistantships in the chemistry department are funded at $10,500/9 months

5. **Increase amount of hood space.** The reviewers

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Primary Contact Name/Info:
Dr. Carmen Huffman, NS 212, x3682

Student Learning Outcome 3 Understand and perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation

Method of Assessment This learning outcome is assessed in CHEM 370 lab, the laboratory component of Instrumental Analysis I. In this course, students learn to work with advanced instrumentation including high performance liquid chromatography, ion chromatography, gas chromatography/mass spectrometry, fluorescence spectroscopy, atomic absorption spectroscopy, inductively-coupled plasma/optical emission spectroscopy, ultra-violet/visible spectroscopy and Fourier-transform infrared spectroscopy. Students learn to use the instruments by reading a lab handout and observing a demonstration. Correct usage can be determined by observing data output, and students' results are part of their grade in the lab-component of the course.

Results of Assessment After reading a handout and seeing a demonstration on the use of the above-listed instrumentation, students are able to use the equipment with some guidance. The average lab grade this year was a C. However, instructors noticed a decrease in the competency of the students compared to previous years when the average lab grade was a B. A B/C average indicates that students had a satisfactory understanding of how to use the equipment.

Implementation Plan Drs. David Evanoff, Scott Huffman, and Arthur Salido have recently submitted a grant proposal to the National Science Foundation for $200,000 for the purchase of new equipment that will be used to further enhance the training of our students in this area. If funded, students will build instrumentation by assembling parts to improve their overall understanding of how the instruments work. They will also have the opportunity to use some instruments more than once, allowing instructors to observe the retention of user capabilities. A secondary component of the grant is to develop new assessment tools in collaboration with the Department of Educational Leadership and Foundation.

Student Learning Outcome 4 Record, process and critically evaluate data obtained in a modern laboratory

Method of Assessment This learning outcome is assessed in many chemistry laboratory courses including CHEM 232, 370, 371, 470, and 472. For this year, the learning outcome will be assessed by CHEM 370 lab, the laboratory component of Instrumental Analysis I. In this course, students collect and record data from sophisticated equipment (as described above), and then must process and analyze it to determine its chemical meaning. Data is recorded in a laboratory notebook, and the analysis and evaluation of results are reported by the students in lab reports which are graded.

Results of Assessment The average lab grade this year was a C. However, instructors noticed a decrease in the competency of the students compared to previous years when the average lab grade was a B. A B/C average indicates that students had a satisfactory understanding of data analysis and interpretation.

Implementation Plan Grading of laboratory notebook entries can be used as a method for assessing students' ability to record data. However, this practice has not been a main focus for the department due to the lack of an agreed-upon standardized lab notebook format. Such a tool is currently being developed by Drs. Carmen Huffman and Charles Marth. With the completion of a departmental lab notebook guide, graded laboratory notebooks may become a standard component of all lab grades. Additionally, if funding described above is received, the curriculum of CHEM 370 lab will change dramatically to become more instrument focused, as opposed to data interpretation focused. Data analysis and interpretation will become part of CHEM 370 lecture and possibly CHEM 232 (Quantitative Analysis). These courses and others mentioned above will then be used to assess this learning outcome.

Western Carolina University
M.S./4+1 in Chemistry
Department of Chemistry and Physics
College of Arts and Sciences
Annual Assessment Report for 2009-2010

Primary Contact Name/Info:
Brian Dinkelmeyer (x3675, dinkelmeyer@*email.wcu.edu*)
229 Natural Science Building

Student Learning Outcome(s) Assessed in 2009-10	Method(s) of Assessment	Results of Assessment	Implementation Plan
State the learning outcome(s) that the program assessed in the 2009-10 assessment cycle.	Provide a summary of the methods used to assess the chosen outcome. Note any changes in the assessment measures from the program's official assessment plan.	Results must include a summary of major findings, interpretation of the results, and a description of how the results were disseminated to key stakeholders for discussion.	Identify what programmatic/curricular changes or improvements you will make as a result of the assessment. Each recommended action must be specific and relate directly to the outcome and results of assessment. A description of the timeline for action and the person(s) responsible must be included. In addition, please include a brief description of resources that will be critical to implementation of the actions proposed, if applicable.

Program Goals:
1. Teach students the structure of modern chemistry.
2. Provide practical training for our students in modern laboratory techniques, methods, instrumentation and data analysis. The laboratory experience should expand upon and reinforce the classroom experience and provide modern context for chemical knowledge.
3. Provide the skills and opportunities necessary for graduates to fuse their classroom and laboratory experiences across the chemistry curriculum, so that they can become scientists, able to self-educate and move intellectually beyond the specifics of what they have learned in the world.
4. Maintain approved program status by the ACS so that our curriculum content is approved by the premier professional chemistry society in the world.

Student Learning Outcomes:
1. Articulate the principles and methods of chemistry.
2. Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.
3. Perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation.
4. Record, process and critically evaluate data obtained in a modern laboratory.
5. Independently gather, interpret and communicate the results of original research.

Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

The MS in Chemistry degree requires a written thesis and oral defense. The thesis is edited by the candidate's research advisor and TRAC committee. The oral defense is open to the public.

Results of Assessment:

Our successful MS students leave our program with the necessary skills to work in industry or continue their academic career's at PhD granting institutions.

Implementation Plan:

This is a degree requirement and we will continue with this practice.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

Each graduate student prepares a written document describing their research plans for the M.S. degree before their 2nd semester. In their 2nd or 3rd semester students are required to meet with their TRAC committee to present/defend/discuss their research plan.

Results of Assessment:

In our last self-evaluation we implemented stricter enforcement of the deadlines for submission of research prospectuses. We have had success in substantially decreasing late submissions. We are enforcing this policy by making the prospectus part of the graduate seminar grade. We still have a few late submissions mostly due to slow editing by research advisors.

Implementation Plan:

We are continuing to enforce the research prospectus requirement in CHEM696 seminar. We plan on including the research prospectus as part of the formal application process for the 4+1 MS students. Alternatively, we are also discussing making the prospectus part of the CHEM698 Research grade.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

CHEM 696: Seminar. Students present a number of oral presentations on their research project. The students are told to use these opportunities to polish their research presentation in preparation for their TRAC meeting. Their presentation's are critiqued by their peers and graded by the instructor.

Results of Assessment:

The peer review has been very helpful in preparing students for their TRAC meetings each semester. There has been a noticeable improvement in the quality and preparation of students for their TRAC meetings.

Implementation Plan:

We plan on continuing this practice.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

CHEM 696: Seminar. We have a number of external speakers each semester. Students are required to write short papers about the speaker's research. These short papers are based on the oral presentation and recent publications of the speaker. The aim of this practice is to improve the writing skills of our MS candidates.

Results of Assessment:

It is difficult to gauge whether there has been an improvement in our students writing skills.

Implementation Plan:

We plan on continuing this practice. Although we do not have a metric for measuring the quality of our students writing, we believe that the practice of writing will improve their skills.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

<u>*CHEM 696: Seminar*</u>. Students are required prepare and deliver a lecture for the CHEM140 General Chemistry Course. It is hoped that this practice will improve our candidate's mastery of foundation concepts in chemistry.

Results of Assessment:

We have just implemented this practice and do not have a metric to measure it's success. Most of the students have found the process beneficial.

Implementation Plan:

We plan on continuing this practice.

II. Student Learning Outcome 2: Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.

Method of Assessment: Thesis Prospectus:
Results of Assessment: *See section I*
Implementation Plan: *See section I*

II. Student Learning Outcome 2: Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.

Method of Assessment: Seminar: prepare and deliver a lecture for the CHEM140 General Chemistry Course.
Results of Assessment: *See section I*
Implementation Plan: *See section I*

III. Student Learning Outcome 3: Perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation.

Method of Assessment:

CHEM698: Independent research is a requirement of our program. Students use state-of-the-art instrumentation in pursuing their individual projects and gain mastery in their operation use and maintenance. All of our MS candidates are enrolled in research during the school year. Roughly half are enrolled in the summer terms. Grades are assigned by the research advisor. The basis of how a research grade is assigned is determined by individual research advisors.

Results of Assessment:

We have begun questioning the method of how research grades are assigned. It appears that there is some grade inflation with many research advisors assigning "A's" to even their un-productive researchers. We plan addressing this issue in the upcoming year.

We have begun a departmental discussion on how grades are assigned for the CHEM696 Research course. Some have suggested that we move to a common syllabus with uniform expectations. This is proving difficult due to the different expectations and measures of productivity in the sub disciplines of chemistry. Another suggestion is that research grades be assigned by the student's TRAC committee based on their research presentation and research progress report. Others suggest that that the grade should be a weighted average composed of grades assigned by the research advisor and individual TRAC committee members.

Implementation Plan:

We plan on implementing some of the suggestions in regards to grading discussed above.

IV. Student Learning Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory.

Method of Assessment:

CHEM699: Thesis. A written thesis and oral defense is a requirement of our program. The thesis describes a student's research by providing data, interpretations of the data, and meaningful scientific conclusions

Results of Assessment: *See section I*

Implementation Plan: *We will continue this practice*

IV. Student Learning Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory.

Method of Assessment:

MS students are required to submit weekly research progress forms in seminar. These require consultation with their research advisors who must sign and date the forms.

Results of Assessment:

There has been an improvement in student's preparation for their TRAC meetings. It is difficult to determine if there has been in increase in research productivity.

Implementation Plan: *We will continue this practice*

V. Student Learning Outcome 5: Independently gather, interpret, and communicate the results of original research*:*

Method of Assessment:

CHEM699: Thesis. A written thesis and oral defense is a requirement of our program.

Results of Assessment: *See section I*

Implementation Plan: *We will continue this practice*

V. Student Learning Outcome 5: Independently gather, interpret and communicate the results of original research.

Method of Assessment:

CHEM698: Independent research is a requirement of our program. Last year we began enforcing the requirement that students meet with their TRAC committee each and every semester.

Results of Assessment:

Research productivity and student engagement seems to have improved. Students are more informed about the program requirements. We are discussing possible changes to the grading policy in CHEM698 (*see section II*I)

Implementation Plan:

We plan on changing the grading policy for CHEM698 Research (*see section III*)

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College of Arts and Sciences
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Primary Contact Name/Info:
Dr. Carmen Huffman, NS 212, x3682

Student Learning Outcome 1: Students will perform competently on national, standardized examinations that are developed and distributed by the American Chemical Society (ACS).

- *Method of Assessment*: This learning outcome is assessed by student grades on standardized ACS exams. The only exams given this academic year were administered by Dr. Brian Dinkelmeyer as the final exam in CHEM 242 (Organic Chemistry II). Results and observations are to be shared with the departmental curriculum committee to determine if adjustments need to be made in what is covered in the course.

- *Results of Assessment*: Figure 1 below shows a histogram of the exam scores for the Spring 2011 class (red bars). The average score on the exam was 45% with a standard deviation of 11% ($N = 34$). This is about 10 points lower than the average provided by the ACS (56% with a standard deviation of 16%). However, considering the large standard deviations from both exams, the distributions are quite wide, and, as can be seen in Figure 1, they overlap fairly well.

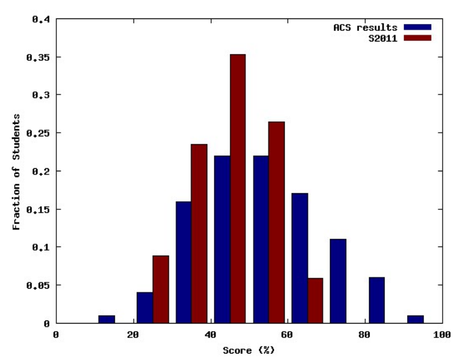

Figure 1: Distribution of scores on the organic ACS exam taken by Spring 2011 students (red bars) and students across the nation (blue bars).

Most of the students in the Spring 2011 class take CHEM 242 immediately after completing CHEM 241 (Organic I) the previous fall semester. However, the course is also offered in the Fall, and the students taking the course in the fall semester have the disadvantage of having the summer break interrupt the sequential nature of these courses. The distributions of the Spring 2011 and Fall 2010 exam scores have been overlaid in Figure 2 for comparison. As one can clearly see, the distribution from the Fall semester (blue bars) lies considerably to the left of the spring semester scores (red bars). The average score from the fall semester is 37% with a standard deviation of 9% ($N = 31$). This data suggests that the students perform more poorly in this course in the fall than students taking the course in the spring, but a larger sample of data should be collected before conclusions can be drawn.

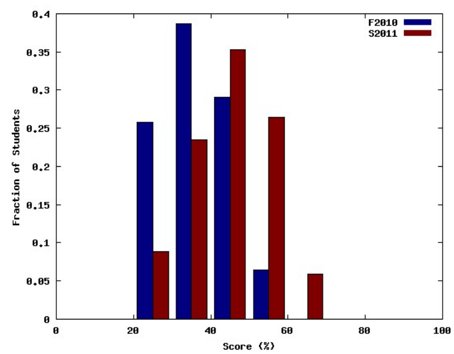

Figure 2: Distribution of scores on the organic ACS exam taken by Spring 2011 students (red bars) and Fall 2010 students (blue bars).

- *Implementation Plan*: Based on the data presented in Figure 1, we feel that no changes need to be made in the content of the organic chemistry course sequence. However, based on the comparison of the spring and fall student performance (Figure 2), we should consider some changes to the fall course offering. Below are some options to be considered by the organic chemistry professors in conjunction with the department head and the curriculum committee.

  1. Do not offer CHEM 242 in the fall semester. *This option would create significant challenges with course scheduling, both for our department as well as for students. Indeed, it may even inhibit students from progressing in their coursework in a timely fashion, particularly students that change their major.*
  2. Provide a CHEM 241 review during the first few weeks of the CHEM 242 course when it is offered in the fall. *The obvious downside of this option is that time taken for review will take time away from CHEM 242 content at the end of the*

semester. Faculty would need to evaluate the relative importance of quality vs. quantity.

3. Provide some sort of independent review system where students review material from CHEM 241 on their own but in a way that's organized and structured by the CHEM 242 faculty member. This could take the form of an online set of slide shows followed by quizzes. *This may be the best solution in that the students are still offered a review of the CHEM 241 course material, but, since the students review on their own time, the review doesn't detract from scheduled CHEM 242 class time. The difficulty would be in providing sufficient motivation for the students to complete the review, especially since they will be responsible for the CHEM 242 material simultaneously.*

Additional data will be collected over the next year, and the solutions proposed above will be discussed.

Student Learning Outcome 2: The department must maintain its approved program status by the ACS so that our curriculum content is objectively assessed, and approved, by the premier professional chemistry society in the world.

- *Method of Assessment*: The department submits an annual report to the ACS. While no direct feedback is provided, the preparation of the report (by the department head) gives us an opportunity to evaluate our curriculum regularly. Additionally, our program undergoes an approval process by the Committee on Professional Training (CPT, a group within the ACS) every five years. We are currently preparing our report for the approval process, so recent results are not yet available. However, the approval process requires us to teach a particular curriculum, and we use these guidelines to develop and update our curriculum regularly. The assessment of our curriculum falls on the shoulders of the departmental curriculum committee, as they work to align our curriculum to the teaching philosophies of the faculty while simultaneously adhering to ACS guidelines.

- *Results of Assessment*: Feedback from the most recent 5-year review (summarized in our Annual Report from 2005-2006) has been useful in addressing some issues within our program, enumerated below.

  1. There was a lack of inorganic content in the CHEM 372 laboratory (now CHEM 472). *We have since hired a new inorganic professor and half of this course is devoted to inorganic synthesis.*
  2. There was inadequate ventilation in several laboratories. *With the Stillwell renovation, much of this has been resolved.*
  3. Our undergraduate research course, CHEM 380, lacked a rigorous writing component. *While our 2005-2006 annual report suggested we were working on requiring a writing sample for this course, we have failed to adopt and implement a common syllabus.*

4. Our department's request for the approval of an environmental chemistry program was denied. *Our department has hired many new tenure-track faculty since the 2005-2006 report was submitted, and due to the areas of interest of those new faculty, an environmental chemistry program is no longer a priority.*
5. Some courses, CHEM 330, CHEM 361 and CHEM 461 were considered marginal as advanced courses. *While we disagreed that CHEM 361 needed adjustment, we have since hired a new biochemist to teach that course, and we feel it remains sufficiently rigorous. We feel the weakness in the other courses was due to the low level of the accompanying laboratories. Chemistry majors are no longer allowed to take the laboratory portions. Instead, they enroll in more advanced lab classes, CHEM 370 and CHEM 470.*

- *Implementation Plan*: Based on our response to issues described above, we feel we have successfully met with ACS standards in all areas mentioned except the writing requirement of CHEM 380. This issue will be raised at an early faculty meeting next fall, and a subcommittee will be formed to implement a syllabus with a writing requirement for this course. The syllabus will be flexible enough to allow academic freedom for faculty, but will include some mandatory components (like written student work) to maintain compliance. Having successfully addressed all other issues, we are confident that we will be able to maintain our ACS accreditation upon review this summer.

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Primary Contact Name/Info:
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229 Natural Science Building

Student Learning Outcome(s) Assessed in 2009-10	Method(s) of Assessment	Results of Assessment	Implementation Plan
State the learning outcome(s) that the program assessed in the 2010-11 assessment cycle.	Provide a summary of the methods used to assess the chosen outcome. Note any changes in the assessment measures from the program's official assessment plan.	Results must include a summary of major findings, interpretation of the results, and a description of how the results were disseminated to key stakeholders for discussion.	Identify what programmatic/curricular changes or improvements you will make as a result of the assessment. Each recommended action must be specific and relate directly to the outcome and results of assessment. A description of the timeline for action and the person(s) responsible must be included. In addition, please include a brief description of resources that will be critical to implementation of the actions proposed, if applicable.

Program Goals:
1. Teach students the structure of modern chemistry.
2. Provide practical training for our students in modern laboratory techniques, methods, instrumentation and data analysis. The laboratory experience should expand upon and reinforce the classroom experience and provide modern context for chemical knowledge.
3. Provide the skills and opportunities necessary for graduates to fuse their classroom and laboratory experiences across the chemistry curriculum, so that they can become scientists, able to self-educate and move intellectually beyond the specifics of what they have learned in the world.
4. Maintain approved program status by the ACS so that our curriculum content is approved by the premier professional chemistry society in the world.

Student Learning Outcomes:
1. Articulate the principles and methods of chemistry.
2. Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.
3. Perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation.
4. Record, process and critically evaluate data obtained in a modern laboratory.
5. Independently gather, interpret and communicate the results of original research.

We have been evaluating all 5 student learning outcomes. All of these learning outcomes are covered by student's independent research, prospectus and thesis writing requirements and oral presentations in seminar and thesis defense. Much of the information has not changed since last year. We have implemented two changes since the last assessment. The first change was increasing the academic rigor of the 4+1MS program. The second change is an attempt to increase research productivity by instituting a new grading policy for CHEM698: Research.

Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

The MS in Chemistry degree requires a written thesis and oral defense. The thesis is edited by the candidate's research advisor and TRAC committee. The oral defense is open to the public.

Results of Assessment:

Our successful MS students leave our program with the necessary skills to work in industry or continue their academic career's at PhD granting institutions.

Implementation Plan:

This is a degree requirement and we will continue with this practice.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

Each graduate student prepares a written document describing their research plans for the M.S. degree before their 2nd semester. In their 2nd or 3rd semester students are required to meet with their TRAC committee to present/defend/discuss their research plan. Students practice their prospectus presentation in seminar before meeting with their TRAC committee.

Results of Assessment:

We have eliminated late submissions of prospectuses. The quality of prospectuses and presentations in TRAC meetings have improved. We have implemented stricter enforcement of the deadlines for submission of research prospectuses.

Implementation Plan:

We are continuing to enforce the research prospectus requirement in CHEM696 seminar. We now require a research prospectus as part of the formal application process for the 4+1 MS students.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

<u>CHEM 696: Seminar.</u> Students present a number of oral presentations on their research project. The students are told to use these opportunities to polish their research presentation in preparation for their TRAC meeting. Their presentation's are critiqued by their peers and graded by the instructor.

Results of Assessment:

The peer review has been very helpful in preparing students for their TRAC meetings each semester. There has been a noticeable improvement in the quality and preparation of students for their TRAC meetings.

Implementation Plan:

We plan on continuing this practice. In the upcoming year we will institute a policy that Thesis defenses must be presented in the seminar course. This will ensure a large turnout of students and faculty. We believe this practice will improve the quality of MS thesis and defenses.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

CHEM 696: Seminar. We have a number of external speakers each semester. Students are required to write short papers about the speaker's research. These short papers are based on the oral presentation and recent publications of the speaker. The aim of this practice is to improve the writing skills of our MS candidates.

Results of Assessment:

It is difficult to gauge whether there has been an improvement in our students writing skills.

Implementation Plan:

We plan on continuing this practice. Although we do not have a metric for measuring the quality of our students writing, we believe that the practice of writing will improve their skills.

I. Student Learning Outcome 1: Articulate the principles and methods of chemistry.

Method of Assessment:

CHEM 696: Seminar. Students are required prepare and deliver a lecture for the CHEM140 General Chemistry Course. It is hoped that this practice will improve our candidate's mastery of foundation concepts in chemistry.

Results of Assessment:

We have just implemented this practice and do not have a metric to measure it's success. Most of the students have found the process beneficial.

Implementation Plan:

We plan on continuing this practice.

II. Student Learning Outcome 2: Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.

Method of Assessment: Thesis Prospectus:
Results of Assessment: *See section I*
Implementation Plan: *See section I*

II. Student Learning Outcome 2: Apply the principles and methods of chemistry to the description of chemical; systems and to the solution of chemical problems.

Method of Assessment: Seminar: prepare and deliver a lecture for the CHEM140 General Chemistry Course.
Results of Assessment: *See section I*
Implementation Plan: *See section I*

III. Student Learning Outcome 3: Perform common laboratory techniques competently utilizing state-of-the-art scientific instrumentation.

Method of Assessment:

CHEM698: Independent research is a requirement of our program. Students use state-of-the-art instrumentation in pursuing their individual projects and gain mastery in their operation use and maintenance. All of our MS candidates are enrolled in research during the school year. Roughly half are enrolled in the summer terms. Grades are assigned by the research advisor. The basis of how a research grade is assigned is determined by individual research advisors.

Results of Assessment:

Last year our department has discussed the issue of grade inflation in CHEM698: research. It is believed that easy grading practices hare a factor in low student research productivity. The department has decided that grades will still be assigned by the thesis advisor with input from the TRAC committee. It is hoped that a more honest evaluation of student research progress will result in the assignment of more realistic grades. It is hoped that over time this will instill a greater work ethic in our MS candidates.

Implementation Plan:

We will continue this policy.

IV. Student Learning Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory.

Method of Assessment:

CHEM699: Thesis. A written thesis and oral defense is a requirement of our program. The thesis describes a student's research by providing data, interpretations of the data, and meaningful scientific conclusions.

Results of Assessment: *See section I*

Implementation Plan: *We will continue this practice*

IV. Student Learning Outcome 4: Record, process and critically evaluate data obtained in a modern laboratory.

Method of Assessment:

MS students are required to submit weekly research progress forms in seminar. These require consultation with their research advisors who must sign and date the forms.

Results of Assessment:

There has been an improvement in student's preparation for their TRAC meetings. There has been in increase in research productivity with the newer students. Some of the older students have not been able to break their bad work habits they have learned before this policy was enforced.

Implementation Plan: *We will continue this practice*

V. Student Learning Outcome 5: Independently gather, interpret, and communicate the results of original research*:*

Method of Assessment:

CHEM699: Thesis. A written thesis and oral defense is a requirement of our program.

Results of Assessment: *See section I*

Implementation Plan: *We will continue this practice*

V. Student Learning Outcome 5: Independently gather, interpret and communicate the results of original research.

Method of Assessment:

CHEM698: Independent research is a requirement of our program. Last year we began enforcing the requirement that students meet with their TRAC committee each and every semester.

Results of Assessment:

Research productivity and student engagement have improved. Students are more informed about the program requirements. We have changed the grading policy for CHEM698 Research (*see section II*)

Other:

The 4+1 MS program allows students to transfer up to 12 hrs of their upper level chemistry courses toward the 30 hrs required for the traditional MS degree. We have changed the 4+1 degree requirements so that they are more rigorous. They are now equivalent to the BS ACS degree in terms of course requirements but include a larger research component. Previously, the 4+1 requirements were similar to the BS Chemistry degree.

Results of Assessment:

We expect this change to improve the quality of our 4+1 applicants and provide them with a stronger foundation in chemistry.

C.11 Curriculum and program learning outcomes

Learning outcomes are described in the most recent assessment plan. (See Appendix C.9.) They are itemized below:

- Outcome 1: Students will perform competently on national, standardized examinations that are developed and distributed by the ACS.
- Outcome 2: The department must maintain its approved program status by the ACS so that our curriculum content is objectively assessed, and approved, by the premier professional chemistry society in the world.
- Outcome 3: Students will be able to perform common laboratory techniques competently and be familiar with the operation and applications of state-of-the-art scientific instrumentation.
- Outcome 4: Students will be able to record, process, and critically evaluate data obtained in a modern laboratory.
- Outcome 5: Students will demonstrate competence in independently gathering, interpreting, and communicating the results of original research.

C.12 Examples of student work

Examples of students' work may be made available upon request.

D Documentation for Standard 4

D.1 Distribution of age, tenure status, gender, and ethnic origin of faculty

Tabulated Summary

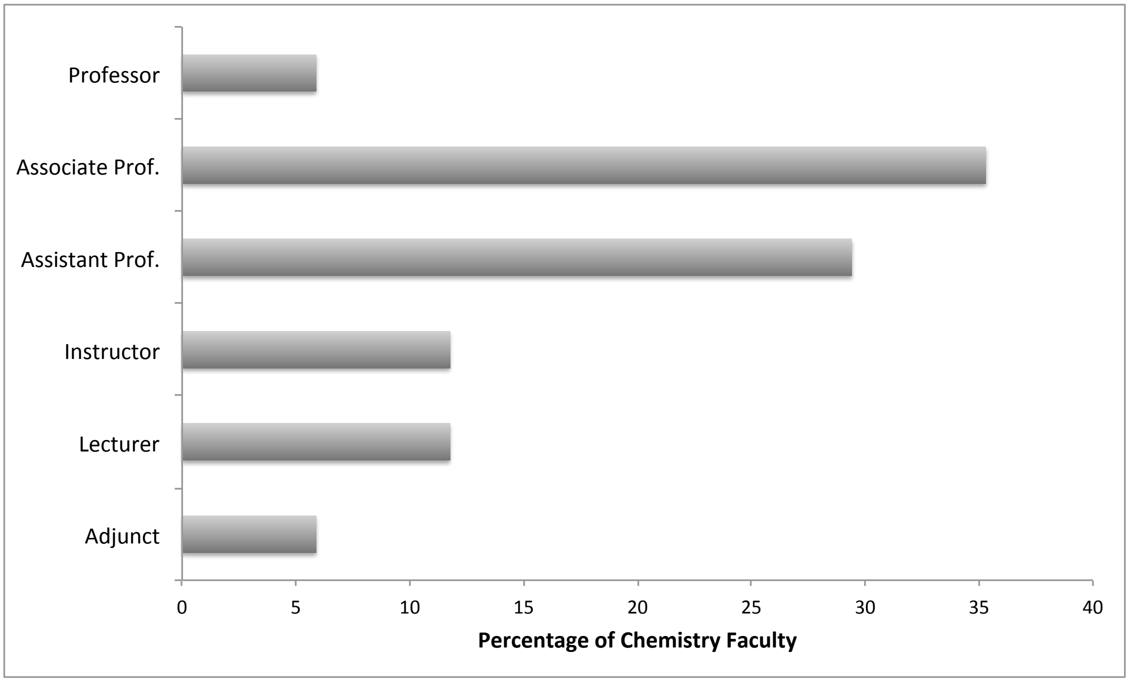
Instructor	Status[a]	Title	Tenure	Gender[b]	Race	Age
Arrington, Megan E.	Perm/FT	Lecturer	N/A	F	White	26
Atterholt, Cynthia A.	Perm/FT	Associate Prof.	Tenured	F	White	57
Butcher, David J.	Perm/FT	Professor	Tenured	M	White	52
Butcher, Karen L.	Perm/FT	Instructor	N/A	F	White	53
Clement, Jason A.	Perm/FT	Assistant Prof.	Tenure-Track	M	White	34
Clement, Suet-Hing	Temp/PT	Adjunct	N/A	F	Asian	38
Davis, Paul H.	Perm/FT	Lecturer	N/A	M	White	58
De Silva, Channa R.	Perm/FT	Assistant Prof.	Tenure-Track	M	Asian	35
Dinkelmeyer, Brian D.	Perm/FT	Associate Prof.	Tenured	M	White	43
Evanoff, David D.	Perm/FT	Assistant Prof.	Tenure-Track	M	White	34
Huffman, Carmen L.	Perm/FT	Assistant Prof.	Tenure-Track	F	White	32
Huffman, Scott W.	Perm/FT	Associate Prof.	Tenured	M	White	40
Kwochka, William R.	Perm/FT	Associate Prof.	Tenured	M	White	51
Marth, Charles F.	Perm/FT	Instructor	N/A	M	White	51
Salido, Arthur L.	Perm/FT	Assistant Prof.	Tenure-Track	M	White	40
Summers, Jack S.	Perm/FT	Associate Prof.	Tenured	M	White	52
Van Dyke, Michael	Perm/FT	Associate Prof.	Tenure-Track	M	White	53

[a] Temp = temporary, Perm = permanent, FT = full-time, PT = part-time
[b] M = male, F = female

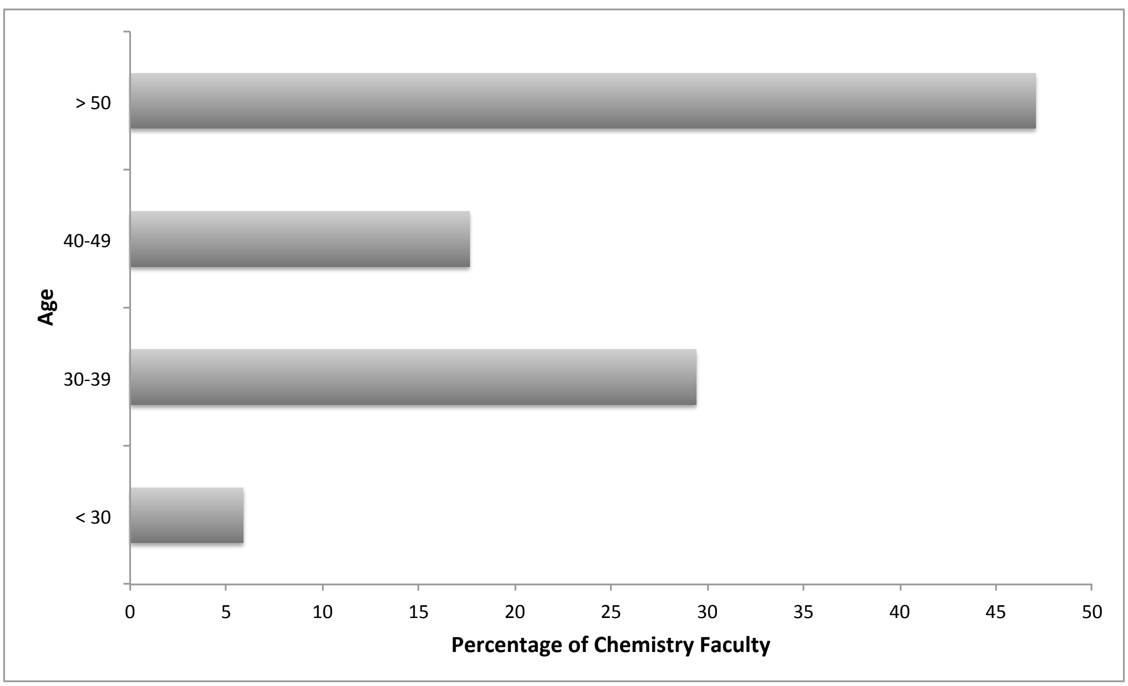
Distribution of Characteristics

Characteristic	Percentage of Faculty
Tenure & Tenure-Track	71%
Female	29%
Minority	12%
Part-time	6%

Distribution of Faculty Ranks



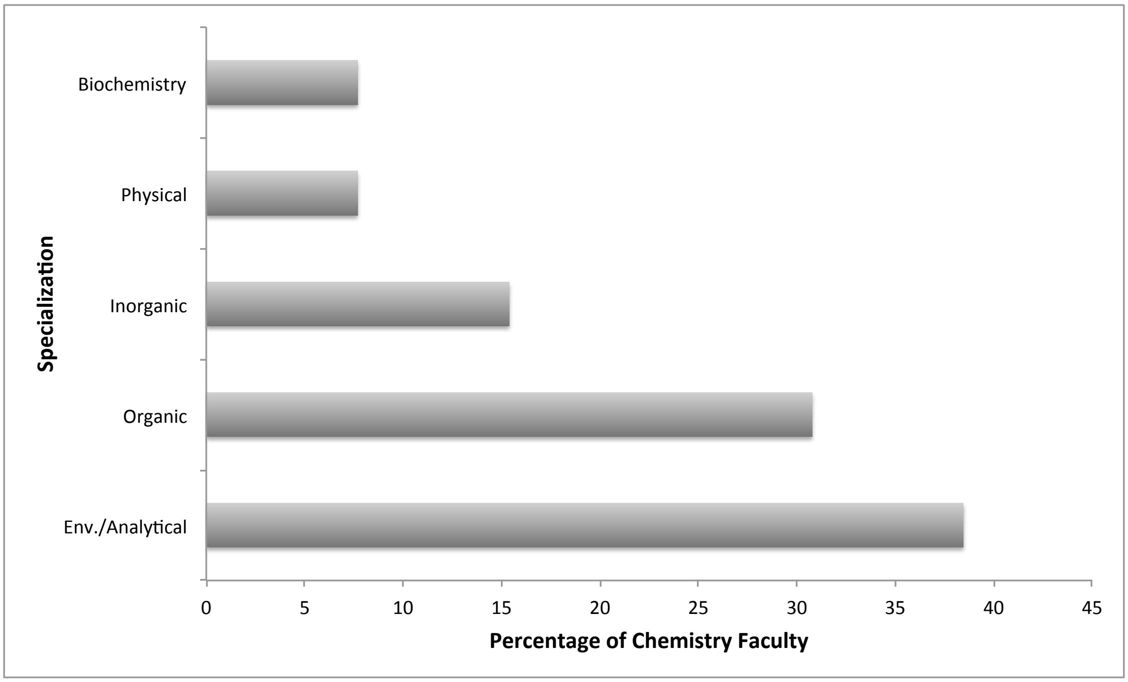
Distribution of Faculty Age



D.2 Credentials for full- and part-time faculty

Instructor	Credentials	Specialization
Arrington, Megan E.	MS Western Carolina Univ. BS Western Carolina Univ.	N/A
Atterholt, Cynthia A.	Ph.D. Univ. of California, Davis MS Winthrop BS Kent State	Environmental
Butcher, David J.	Ph.D. Univ. of Connecticut BS Univ. of Vermont	Analytical
Butcher, Karen L.	Ph.D. Univ. of Connecticut BS Univ. of Vermont	N/A
Clement, Jason A.	Ph.D. Virginia Tech. BS Western Carolina Univ.	Organic
Davis, Paul H.	MS Western Carolina Univ. BS Western Carolina Univ.	N/A
De Silva, Channa R.	Ph.D. Univ. of Arizona, Tucson BS Univ. of Kelaniya	Inorganic
Dinkelmeyer, Brian D.	Ph.D. SUNY - Stony Brook BS SUNY - Oswego	Organic
Evanoff, David D.	Ph.D. Clemson Univ. BS Westminster College	Analytical
Huffman, Carmen L.	Ph.D. Univ. of Maryland BS Univ. of Rhode Island	Physical
Huffman, Scott W.	Ph.D. Univ. of Rhode Island MS Univ. of North Carolina, Wilmington BS Univ. of North Carolina, Wilmington	Analytical
Kwochka, William R.	Ph.D. North Carolina State BS Grinnell College	Organic
Marth, Charles F.	Ph.D. Univ. of Wisconsin BS Duke Univ.	Organic
Salido, Arthur L.	Ph.D. Wake Forest Univ. BS Vanderbilt Univ.	Analytical
Summers, Jack S.	Ph.D. Georgia Inst. of Technology BS Univ. of West Florida	Inorganic
Van Dyke, Michael	Ph.D. California Inst. of Tech. BS Monmouth College	Biochemistry

Distribution of faculty specialization



D.3 Summary of faculty sponsored research activities

Funded Proposals

Year	PI	Amount ($)	Funding Agency	Title
2007	Salido, Arthur[a]	100,000[b]	NSF & Dept. of Homeland Security	A portable tungsten-coil atomic emission detector for nuclear forensics
2008	Huffman, Scott	20,000[c]	TERAGRID	Calculation of the intrinsic reaction coordinate of butadiene derivatives in solid state reactions
2009	Clement, Jason	250,000	NC Biotechnology Center	Use of Genetic Markers and Chemical Quantification to Identify Populations of *Actaea racemosa* (Black Cohosh) With Desirable Properties for Breeding a Regional Cultivar
2009	Evanoff, David	45,000[d]	Research Corporation	Synthesis and characterization of silver core-dielectric spacer-metal shell nanoparticles and their application to surface enhanced spectroscopy
2009	Kwochka, William[e]	37,643	Savannah River Nat'l Lab[f]	Organo-boron based self assembly chemistries: Toward improved material design and charge injection
2009	Summers, Jack	60,000	NC Biotechnology Center	Superoxide dismutase inhibition and its affect on bacteria
2010	Atterholt, Cynthia	10,000	Isca Technologies	Controlled release of insect pheromones
2010	Clement, Jason	5,000	NC Biotechnology Center	Undergraduate Research Fellowship: Isolation and Characterization of Antibiotic Compounds from Bacteria Associated with the Roots of *Tsuga canadensis* (Rachel Bleich)
2010	Evanoff, David	306,175	NSF	MRI: Acquisition of a Raman Microscope for Undergraduate Research and Education

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[a] co-PI; A collaborative proposal with Wake Forest University and Winthrop University
[b] Grant total was $300,000: $100,000 was awarded to WCU; the remainder was awarded to co-PIs at other institutions
[c] Actual funding is in kind; 20,000 hours. In the private sector, supercomputer cost is $\geq$$1/hr.
[d] Total amount includes a $10,000 match from WCU
[e] co-PI; A collaborative proposal with Savannah River Nat'l Lab
[f] contract

Year	PI	Amount ($)	Funding Agency	Title
2010	Kwochka, William[a]	37,643	Savannah River Nat'l Lab[b]	Organo-boron based self assembly chemistries: Toward improved material design and charge injection
2010	Summers, Jack	325,000	NIH	R15: Inhibition of superoxide dismutases
2011	Van Dyke, Michael	5,000	NC Biotechnology Center	Structural Studies of the Stress-response Translation Regulator Stm1p
Funds Received		**1,201,461**		

[a] co-PI; A collaborative proposal with Savannah River Nat'l Lab
[b] contract

Denied Proposals

Year	PI	Amount ($)	Funding Agency	Title
2007	Butcher, David	548,766	NSF	Establishment of the Partnership for Educational Advancement and Economic Development by Western Carolina University and Tri-County Community
2007	Huffman, Carmen	176,308	UNC Research Competitiveness Fund	Structure and Reactivity of Organic Coatings on Inorganic Aerosol Particles
2007	Huffman, Scott	62,500	NC Biotechnology Center	Search for Renewable, Biodegradable Dyestuffs
2007	Salido, Arthur	10,000	Great Smoky Mountains Conservation Association	Analyzing soil samples in historic “dump” sites located in the Great Smoky MNP to determine the existence of heavy metals
2007	Salido, Arthur	74,229	NSF	Innovative Approaches to Energy: A New Course on the Synthesis and Characterization of Biofuels
2007	Salido, Arthur[a]	1,100,217	NSF	MRI: Development of a Tungsten Coil Atomic Emission Spectrometer
2008	Clement, Jason	300,000	NC Biotechnology Center	Use of DNA barcoding and chemical quantification to identify populations of *Actaea racemosa* (black cohosh) with desirable properties for breeding a regional cultivar
2008	Salido, Arthur[b]	485,000	NSF	Acquisition of a Liquid Chromatograph coupled to a Triple-Quadrupole Mass Spectrometer (LC/MSMS) for Shared Use by Predominately Undergraduate Institutions in Western North Carolina
2009	Clement, Jason	5,000	NC Biotechnology Center	Undergraduate Research Fellowship: Isolation and Characterization of Potential Antitumor Natural Products from Plants Indigenous to Western North Carolina (Rachel Bleich)
2009	Evanoff, David[c]	50,000	Water Resources Research Institute	Subsurface transport and fate of organic contaminants associated with wastewater and biosolid disposal

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[a] co-PI; A collaborative proposal including Wake Forest University and Winthrop University
[b] co-PI; A collaborative proposal including WCU, UNCA and Warren Wilson College
[c] co-PI; A collaborative proposal with UNCA

Year	PI	Amount ($)	Funding Agency	Title
2009	Evanoff, David	262,898	NSF	MRI-R^2: Acquisition of a Raman Microscope for Undergraduate Research and Education
2009	Huffman, Scott	99,950	Draper Laboratory	Pre-proposal: Requirements, definition, and systems analysis for Differential Mobility Spectrometry applied to Chemical, Biological and Explosives (CBE) detection in the DOD and DHS
2009	Huffman, Scott	33,776	US Army	Orthogonal Fluorescence and Raman Spectroscopy (OFRS) System
2009	Kwochka, William	1,000,000	Dept. of Energy	Pre-proposal: Organo-boron based self assembly chemistries: Toward improved material design and charge injection
2009	Kwochka, William	1,955,000	NSF	ARI: Renovation of Biology and Chemistry Research Facility at Western Carolina University
2010	Evanoff, David	60,000	Camille & Henry Dreyfus Foundation	Inquiry Letter: Putting Chemistry to Work: Using Chemistry Careers for Guided-Inquiry Learning in the Freshman Laboratory
2010	Evanoff, David	50,000	Petroleum Research Fund	Improving the efficiency of thiophene-based bulk heterojunction solar cells via surface enhanced fluorescence
2010	Huffman, Scott	200,000	NSF	The MIDAS Touch: Extending the POGIL approach into the instrumental analysis laboratory for instruction in Method and Instrument Development in the Analytical Sciences
2011	Clement, Jason	5,000	NC Biotechnology Center	Undergraduate Research Fellowship: Large-scale Production of Antibiotic-producing Bacteria from the Root System of *Tsuga canadensis* from the Great Smoky Mountains National Park (Rachel Bleich)
2011	De Silva, Channa	75,000	NC Biotechnology Center	Development of a luminescence-based nanostructured integrated platform for high throughput screening of tumor cell receptor-targeted ligand libraries and biomedical imaging
Funds Requested		**6,004,878**		

Pending Proposals

Year	PI	Amount ($)	Funding Agency	Title
2011	Wilson, Mark	174,965	NC Biotechnology Center	Purchase of Applied Biosystems 3500 HID Genetic Analyzer to Establish DNA Sequencing Core Facility at Western Carolina University

D.4 Curriculum *vitae* of full-time faculty

Presented alphabetically as follows:

- Arrington, Megan (Lecturer) - page 187
- Atterholt, Cynthia (department Head, Associate Professor, Analytical) - page 189
- Butcher, Karen (Instructor) - page 192
- Clement, Jason (Assistant Professor, Organic) - page 193
- Davis, Paul (Lecturer) - page 198
- De Silva, Channa (Assistant Professor, Inorganic) - page 199
- Dinkelmeyer, Brian (Associate Professor, Organic) - page 208
- Evanoff, David (Assistant Professor, Analytical) - page 212
- Huffman, Carmen (Assistant Professor, Physical) - page 216
- Huffman, Scott (Associate Professor, Analytical) - page 222
- Kwochka, William (Associate Professor, Organic) - page 230
- Marth, Charles (Instructor) - page 235
- Salido, Arthur (Assistant Professor, Analytical) - page 237
- Summers, Jack (Associate Professor, Inorganic) - page 239
- Van Dyke, Michael (Associate Professor, Biochemistry) - page 244

Megan Arrington, M.S.
157 Maple Springs Canton, NC 28716
PO Box 811 Hazelwood NC 28738
(828) 550-5369
mearrington@email.wcu.edu

Education

M.S., Chemistry, Western Carolina University, 2010. Thesis: "Superoxide Dismutase Inhibitor Screening and Characterization Using ^{19}F NMR" Advisor: Jack Summers.

B.S., Chemistry, Western Carolina University, 2008. GPA: 3.87/4.00.

Research Experience

Research assistant, Jack Summers — May 2009-May 2010
- High throughput screening of CuZnSOD and MnSOD inhibitors using ^{19}F NMR
- Characterized inhibitors using NMR assays and docking calculations
- Guided lab assistants in sample preparation and the use of NMR assays

Undergraduate Research, Carmen Huffman — Jan 2008-July 2008
- Column chromatography separation of chlorophyll-a from spinach leaves
- Identification of fractions using UV-vis spectroscopy

Undergraduate Research Assistant, Robert Young — Oct 2006-Oct 2007
- Collected and prepared rivercane soil samples using Mehlich extraction method
- Analyzed samples using ICP-OES, AAS and CNS analyzer

Teaching Experience

Lecturer, Western Carolina University — August 2010-current
- General Chemistry Lecturer and Laboratory Instructor

Adjunct Laboratory Instructor, Western Carolina University — June 2010
- General Chemistry I-Laboratory Instructor and chemical preparation

Graduate Teaching Assistant, Western Carolina University — Aug 2008-Dec 2009
- General and Physical Chemistry Laboratory Teaching Assistant

Private Tutor — Sept 2007-Apr2008
- Tutored general chemistry

Catamount Academic Tutoring Center Tutor, Chesney Reich — Jan 2005-May 2005
- Tutored Quantitative Chemical Analysis and General Chemistry

Presentations

Megan Arrington, Michelle Yost, Mariah Hornby, Jonathan Markley, Ben Hickman, Erin Parris, Jeff Schmitt, Jack Summers. Superoxide Dismutase Inhibition Screening and Characterization Using ^{19}F NMR. 240th ACS National Meeting, Boston, MA, August 25, 2010.

Benjamin Hickman, Megan Arrington, Michelle Yost, Mariah Hornby, Jack Summers. Inhibition of CuZnSOD by low MW natural products. 240th ACS National Meeting, Boston, MA, August 22, 2010.

Megan Arrington, Jonathan Markley, Erin Parris, Michelle Yost, Jeff Schmitt, Jack Summers. Superoxide Dismutase Inhibitor Screening and Characterization Using ^{19}F NMR. 71st Annual Meeting of the Association of Southeastern Biologists, Asheville, NC, April 8, 2010.

Megan Arrington, Jonathan Markley, Erin Parris, Benjamin Hickman, Amanda Nance, Michelle Yost, Corey Harrington, Jeff Schmitt, Jack Summers. Superoxide Dismutase Inhibitor Screening and Characterization Using ^{19}F NMR. 18th Annual Graduate Research Symposium, Cullowhee, NC, March 11, 2010.

Megan Arrington, Jonathan Markley, Michelle Yost, Erin Parris, Jeff Schmitt, Jack Summers. Superoxide Dismutase Inhibitor Screening and Characterization Using ^{19}F NMR. 3rd Annual Graduate Student Research Competition Finalist at the 8th Annual 2009 Charlotte Biotechnology Conference, Charlotte, NC, October 8, 2009.

Awards

Dean's Outstanding Scholar-Graduate Student 2008-2009, 2009-2010
Honors College Graduate-Magna cum Laude
Outstanding Science Education Student 2007-2008
Outstanding Freshman Chemistry Student Award 2004-2005

Affiliations

American Chemical Society member
Phi Kappa Phi International Honors Society

References

Jack Summers, Ph.D. – Research Advisor and Professor
Associate Professor of Chemistry
Department of Chemistry and Physics
408 Stillwell Sciences Building
Western Carolina University
Cullowhee, NC 28723
summers@email.wcu.edu
(828) 227-3668

Carmen Huffman, Ph.D. – Research Advisor and Professor
Assistant Professor of Chemistry
Department of Chemistry and Physics
212 Natural Sciences Building
Western Carolina University
Cullowhee, NC 28723
chuffman@email.wcu.edu
(828) 227-3682

Cynthia Atterholt, Ph.D. – Department Head
Associate Professor
Department of Chemistry and Physics
231A Natural Sciences Building
Western Carolina University
Cullowhee, NC 28723
atterholt@email.wcu.edu
(828) 227-3667

Cynthia Atterholt
Associate Professor of Chemistry
Western Carolina University

Education:

Kent State University, Kent, OH	B.S. Ed.	1977	Chemistry and Mathematics
Winthrop University, Rock Hill, SC	M.B.A.	1987	Business Administration
University of California, Davis, CA	Ph.D.	1996	Agricultural & Environmental Chemistry

Research and Professional Experience

2004-Present Department Head, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC.
2002-Present Associate Professor of Chemistry, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC.
1996-2002 Assistant Professor of Chemistry, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC.
1991-1996 Research Assistant, University of California, Davis, Departments of Biological & Agricultural Engineering, and Food Science & Technology.
1984-1991 Chemistry Teacher, Clover High School, Clover, SC.
1981-1984 Development Chemist, Sandoz Chemical Corporation, Charlotte, NC.
1977-1981 Chemical Lab Technician, Union Carbide, Linde Division, North Royalton, OH.

Publications and Patents:

Frederique M. De Lame, James R. Miller, Cynthia A. Atterholt, and Larry J. Gut, "Development and Evaluation of an Emulsified Paraffin Wax Dispenser for Season-Long Mating Disruption of *Grapholita molesta* in Commercial Peach Orchards," *Journal of Economic Entomology*, 2007, 100 (4); 1316-1327.

Invited article on the agricultural use of pesticides published by McGraw-Hill Publishers. The article was published in a set of Chemistry books entitled "Chemistry: Foundations and Applications," 2004.

A.L. Salido, C.A. Atterholt, J.R. Bacon, and D.J. Butcher, "An Environmental Focus using Inductively Coupled Plasma Optical Emission Spectrometry and Ion Chromatography," *J. Chem. Ed.*, 2003, *80*, 22-23.

D.J. Butcher, P.F. Brandt, N.J. Norgaard, C.A. Atterholt, A.L. Salido, "Sparky IntroChem: A Student Oriented Introductory Chemistry Course," *J. Chem. Ed.*, 2003, *80*, 137-139.

Atterholt, C., D. Butcher, J. R. Bacon, W.R. Kwochka, and R. Woosley. 2000. Implementation of an environmental focus in an undergraduate chemistry curriculum by the addition of gas chromatography-mass spectrometry. *Journal of Chemical Education* 77 (12): 1549-1550.

Meissner, H.E., C.A. Atterholt, J.F. Walgenbach and G.G. Kennedy. 2000. Comparison of pheromone application rates, point source densities and dispensing methods for mating disruption of tufted apple bud moth (Lepidoptera: Tortricidae). *J. Econ. Entomol*. **93**:3.

Delwiche, M., J. Krochta, R. Rice, and C. Atterholt. Aqueous emulsion comprising biodegradable carrier for insect pheromones and methods for controlled release thereof. United States Patent, Patent number 6,001,346, December 14, 1999.

Atterholt, C. 1999. Book review of *Chemistry and Mode of Action of Crop Protection Agents*, by L. Copping and H. Hewitt, published by The Royal Society of Chemistry, in *J. Am.Chem. Soc*. **121** (40), p. 9486.

Atterholt, C., M. Delwiche, R. Rice, and J. Krochta. 1999. Controlled Release of Insect Sex Pheromones from Paraffin Wax and Emulsions. *J.Controlled Release*, **57** (3): 233-247.

Atterholt, C., M. Delwiche, R. Rice, and J. Krochta. 1998. Study of biopolymers and paraffin as potential controlled-release carriers for insect pheromones. *J. of Ag. & Food Chem.*, **46** (10), pp. 4429-4434.

Delwiche, M., C. Atterholt, R. Rice. 1998. Spray Application of Paraffin Emulsions Containing Insect Pheromones for Mating Disruption, *Transactions of the ASAE* **41**(2):475-480.

Rice, R., C. Atterholt, M. Delwiche, and R. Jones. 1997. Efficacy of mating disruption pheromones in paraffin emulsion dispensers. *Technology Transfer in Mating Disruption IOBC* wprs Bulletin, **20** (1), pp. 151-161.

Abstracts and Presentations:

Lisa McCracken and Cynthia Atterholt, "Evaluation of wax carriers for the controlled release of pheromones for mating disruption in an integrated pest management program." Poster presentation (AGFD-192) at the 239 National ACS meeting in San Francisco, CA, March 23, 2010. The poster was also chosen for the Sci-Mixer event on March 22, 2010.

Vonny M. Barlow , James F. Walgenbach , Paul H. Davis , Cynthia A. Atterholt, "Performance of selected pheromone reservoir systems for mating disruption of codling moth in the Eastern commercial apple production system." Presented at the National Entomological Society of America meeting in Indianapolis, IN, December 15, 2009.

R. Borges, L. E. J. Mafra, F. M. De Lame, James R. Miller, Larry J. Gut, T. P. Reed, Cynthia A. Atterholt, Reginald R. Coler and Agenor Mafra-Neto, "SPLAT-OFM A & K: a new sex pheromone tool to manage oriental fruit moth populations**."** Paper presentation at the National Meeting of the Entomological Society of America, Fort Lauderdale, FL, December 2005. Agenor Mafra-Neto was the presenting author.

Rafal Krugly, Cynthia Atterholt, and James Walgenbach, "Factors Affecting the Release of Oriental Fruit Moth Pheromone from 3M™ Sprayable Pheromone." Poster presentation at the National Meeting of the Entomological Society of America, Cincinnati, OH, October 2003.

F.M. de Lame, C.A. Atterholt, J.R. Miller, and L.J. Gut. The potential of paraffin-based pheromone dispensing systems for the mating disruption of Oriental fruit moths, *Grapholita molesta* (Busck). Presented at the Cumberland-Shenandoah Fruit Workers Conference, Nov. 2002. F. M. de Lame was the presenting author.

F.M. de Lame, J.R. Miller, C.A. Atterholt, and L.J. Gut. Successful development of a paraffin wax-based pheromone dispenser for season-long mating disruption of the Oriental fruit moth, Grapholita molesta (Busck) in commercial peach orchards in Michigan, USA. IOBC Working Group Meeting: Pheromones and Other Semiochemicals in Integrated Production, Erice, Sicily, September 2002. (poster) F. M. de Lame was the presenting author.

Atterholt, C. Paraffin Pheromone Formulations and their Potential in Mating Disruption, Michigan State University, October, 2001.

Atterholt, C., T. Gore, E. Lincoln, J. Walgenbach. Determining Laboratory Release Rates of Synthetic Insect Pheromones Used as Pesticide Alternatives for Insect Pest Management. Federation of Analytical Chemistry and Spectroscopy Societies, Detroit, MI, October, 2001.

Atterholt, C. Controlled Release of Pheromones from Paraffin and Paraffin Emulsions, Research meeting, Gowan Chemical Co., Yuma, AZ, January 2001.

Gore, T., C. Atterholt, J. Walgenbach. Comparison of Paraffin Emulsion and Isomate® Dispensers for Mating Disruption of Oriental Fruit Moth and Codling Moth. Entomological Society of America National Meeting, Atlanta, GA, December, 1999.

Gore, T., C. Atterholt, J. Walgenbach. Laboratory and Field Studies of Codling and Oriental Fruit Moth Pheromones. Southeastern Regional Meeting of the American Chemical Society, Knoxville, TN, October, 1999.

Sanders, E., C. Atterholt, J. Walgenbach. Evaluation of the Release Rates of Codling Moth Pheromone from Various Dispensers and a Comparison of Laboratory and Field Data. The Annual National Black Graduate Student Conference, Baton Rouge, LA, May 1999.

Woosley, R., C. Atterholt, J. R. Bacon, and D. Butcher. Impact of gas chromatography-mass spectrometry (GC-MS) on the chemistry curriculum at Western Carolina University. National Meeting of the Am. Chem. Society, New Orleans, LA, August 1999.

Atterholt, C. Controlled Release of Insect Pheromones from Paraffin for Mating Disruption of Orchard Pests, Federation of Analytical Chemistry and Spectroscopic Societies, Austin, TX, October 12, 1998.

Roles, D.C., C. Atterholt, H. Meissner, and J. Walgenbach. 1997. Release Rates of Tufted Apple Bud Moth Sex Pheromone at Various Concentrations and Temperatures. Annual Meeting of the Entomological Society of America, Nashville, TN, Paper #214.

Grants and Awards

Chancellor's Travel Fund Award in the amount of $1000 from the to attend the National ACS meeting in San Francisco, CA, March 21-25, 2010.

Research gift in the amount of $10,000 funded by ISCA Technologies Inc., 2010.

Research gift in the amount of $1500 funded by ISCA Technologies Inc., 2006.

PI on an internal grant from the Institute for the Economy and the Future, 2005, in the amount of $2000 to study the controlled release of Gypsy Moth pheromones.

Collaborator on an EPA grant for an air quality study, 2003. WCU received $164,203 for our part of a $750,000 collaborative research project to study the effects of air quality on the lung function of hikers in the Great Smoky Mountain National Park.

Research gifts in the amounts of $5000 and $1000 funded by Gowan, Inc., 2000 and 2001.

Co-PI on a $2500 faculty research grant funded by the Office of Research and Graduate Studies at WCU for the period 7/99 to 6/2000, entitled "Solid Phase Microextraction for the Determination of Volatile chemicals in Fraser FirTissue."

Research gifts in the amounts of $2000 and $1000 funded by Agrium Inc., 1998 and 1999.

Co-PI on a $76,000 grant funded by NSF CCLI-A&I, July 1999, entitled Implementation of an Environmental Focus in an Undergraduate Chemistry Curriculum using Inductively Coupled Plasma Optical Emission and Ion Chromatography."

Co-PI on a $43,744 grant was funded by NSF-ILI, July 1997, entitled, "Implementation of an Environmental Focus in an Undergraduate Chemistry Curriculum by the Addition of Gas Chromatography-Mass Spectrometry."

Professional Affiliations:

Member, American Chemical Society

Curriculum Vitae of Karen L. Butcher
Department of Chemistry and Physics
Western Carolina University
Cullowhee, NC 28723

EDUCATION

Ph.D. Chemistry, 1990, University of Connecticut, Storrs, Connecticut
B.S. Chemistry, 1982, University of Vermont, Burlington Vermont

EXPERIENCE

1991 – present	Department of Chemistry and Physics Western Carolina University, Cullowhee, North Carolina Visiting Assistant Professor
2001 – 2004	Environmental Incorporated Cullowhee, North Carolina Laboratory Supervisor
1990 – 1993	Center for Mathematics and Science Education, Western Carolina University, Cullowhee, North Carolina Project Coordinator - Responsible for coordinating workshops in mathematics and science for elementary school teachers.
1992	Southwestern Community College Sylva, North Carolina Part time Chemistry Instructor
1985 – 1990	University of Connecticut Storrs, Connecticut Teaching Assistant
1983 – 1985	Bowdoin College, Brunswick, Maine Chemistry Laboratory Instructor

PROFESSIONAL MEMBERSHIPS

American Chemical Society, Chemical Education Division

PUBLICATIONS

K. L. Butcher, A. T. DiBennedetto, S. J. Huang, J. F. Johnson, B. W. Kilhenney, J. L. Cercena, "Molecular Weight Characterization of LARC-TPI Powder" in Polyimides:Materials, Chemistry and Characterization, C. Feger, M. M. Khojasteh and J. E. McGrathEditors Elsevier Publishing, 1989, 673 - 683.

Jason Clement

558 Hillcrest St.
Sylva, NC 28779

(828) 227-2717 (office)
jclement@email.wcu.edu

Education

2005	Virginia Tech	Ph.D.	Chemistry
	Thesis advisor:	Professor David G.I. Kingston	
	Thesis title:	Studies of Bioactive Natural Products and Mechanism-Based Bioassays	
2000	Western Carolina University	B.S.	Chemistry
	Undergraduate Research Advisor:	Professor Royce S. Woosley	
	Undergraduate Research Topic:	Comparison of the Volatile Organic Chemical Contents of Canadian Hemlocks (*Tsuga canadensis*) from the Great Smoky Mountains and Shenandoah National Parks	

Research Interests

- Isolation, characterization, and synthesis of novel natural products with useful biological activity.
- Phytochemical analysis of plant-based medicinal products.
- Isolation and characterization of antibacterial compounds from soil bacteria

My research interests are in natural products drug discovery. More than half of all clinically-used drugs are either natural products or synthetically modified derivatives of natural products. The structures of natural products offer inherent diversity and complexity that is impossible to obtain from combinatorial synthetic libraries or traditional synthetic chemistry approaches to drug development. Modern molecular biology methods can help us find potential drug leads within crude natural extracts. With advances in molecular and cell biology, the biochemical understanding of many human diseases has increased. This has led to the development of many *in vitro* assay methods for evaluating the ability of chemical substances to interact with a specific biochemical process. These methods can be applied to hundreds or thousands of crude extracts found in libraries such as the NCI's natural products repository. When combined with modern chemical separation techniques and analytical methods, the structures of the biologically interesting natural products can be elucidated.

I am also interested in the chemical and biological study of plant-based medicinal products. Worldwide, there are many rich traditions of the use of plant extracts as remedies for various ailments. Often, these plant products do not perform well in placebo-controlled clinical trials, while at the same time these plants are known to contain biologically active compounds. Therefore, more scientific investigation of modes of action of plant-based medicine must be brought to bear. By understanding more about how these medicinal products work and how they might work better for certain sub-populations of patients and not others, we may be able to find ways to make plant-based medicines work better for more people. Related to this, it is helpful to use phytochemical analysis methods like HPLC to attempt to identify populations of a plant that has superior levels of biologically active compounds relative to other members of the same species. I have recently also begun research in the isolation and characterization of antimicrobial agents from bacteria from local sources produced by alternative culturing methods.

Teaching and Professional Experience

2007-Present Assistant Professor, Department of Chemistry, Western Carolina University
- Currently teaching general and organic chemistry lecture and lab classes.
- Working alongside graduate and undergraduate students in natural products research.

2006-2007 Postdoctoral Research Fellow, National Cancer Institute-Frederick.
- Conducted research on isolation and characterization of potential antitumor agents from natural sources.
- Supervised and instructed high school student in performing natural product isolations.

2005, 2000-2001 Teaching Assistant, Department of Chemistry, Virginia Tech.
- Taught physical chemistry, synthetic techniques, and general chemistry laboratory classes. Assisted with some experiment development.

1998-2000 Teaching Assistant, Summer Ventures in Science and Math.
- Assisted with teaching mathematical modeling in summer program for gifted high school students

Service Activities

2008 Consultant, Sanesco International Inc., Asheville, NC
- Performed research as a private contractor to develop analytical methods for biomarkers in human urine (summer 2008).

2008, 2010-present Member, Curriculum committee, Dept. of Chemistry and Physics

2009-2011 Member, Advisory Committee for Biotechnology in Western North Carolina

2009-present Member, WCU Health Professions Advisory Committee
Member, WCU Arts and Sciences Safety Committee
Member, Graduate Admissions Committee, Dept. of Chemistry and Physics

Current Collaborations

Joe-Ann McCoy, Bent Creek Germplasm Repository, N.C. Arboretum
Laura DeWald, Department of Biology, Western Carolina University, Cullowhee, NC
Katherine Mathews, Department of Biology, Western Carolina University, Cullowhee, NC
Seán O'Connell, Department of Biology, Western Carolina University, Cullowhee, NC
Isaac Oppong, Department of Chemistry, University of Ghana, Legon, Ghana.
Werner Geldenhuys, Northeast Ohio Medical University, Rootstown, OH.

Affiliations and Awards

Cancer Research Training Award, National Cancer Institute, 2006-2007
Graduate Research Award, Department of Chemistry, Virginia Tech, 2005
Cunningham Fellow, Virginia Tech, 2000-2003

Member of:

American Chemical Society, Organic Section
American Society of Pharmacognosy
Phi Kappa Phi
Phi Lambda Upsilon
Alpha Lambda Delta

Courses Taught

CHEM 132: Survey of Chemistry I (lecture)
CHEM 140: Advanced General Chemistry (lecture and lab)
CHEM 241: Organic Chemistry I (lecture)
CHEM 242: Organic Chemistry II (lecture)
CHEM 272: Organic Chemistry Lab
CHEM 493/593: Special Topics in Chemistry-Natural Products (lecture)
CHEM 493/593: Special Topics in Chemistry-Organic Structure Determination (lecture)

Oral Presentations

“Antimicrobial Agent from a *Pseudomonas* sp. Strain from the Great Smoky Mountains National Park.” (Rachel Bleich, undergraduate presenter). ACS Southeastern Regional Undergraduate Research Conference, Statesboro, GA, Aprl 2011.

“Phytochemical Analysis of *Croton membranaceous*, a Plant Used in Traditional West African Medicine.” 60th Annual Southeast Regional Meeting of the American Chemical Society, Nashville, TN, November, 2008.

“Isolation of Cytotoxic Compounds from Indigenous Plants of Western North Carolina.” (Timothy Willis, undergraduate student presenter). Undergraduate Meeting in Miniature, 60th Annual Southeast Regional Meeting of the American Chemical Society, Nashville, TN, November, 2008.

“Bioactive Triterpenoids from *Petalonyx parryi.*” 56th Annual Southeastern Regional Meeting of the American Chemical Society, Research Triangle Park, NC, November, 2004.

“Studies of Bioactive Compounds from Marine Sources.” 54th Annual Southeastern Regional Meeting of the American Chemical Society, Charleston, SC, November, 2002.

“Comparison of the Volatile Organic Chemical Contents of Canadian Hemlocks (*Tsuga canadensis*) from the Shenandoah and Great Smoky Mountains National Parks.” 15th Annual National Conference on Undergraduate Research, Missoula, MT, April, 2000.

“Comparison of the Volatile Organic Chemical Content of the Needles of the Canadian Hemlock (*Tsuga canadensis*) and the Carolina Hemlock (*Tsuga caroliniana*).” Undergraduate Meeting in Miniature, 51st Annual Southeastern Regional Meeting of the American Chemical Society, Knoxville, TN, October, 1999.

Poster Presentations

“Use of Genetic Markers and Chemical Quantification to Identify Populations of *Actaea racemosa* L. (Black Cohosh) with Desirable Properties for Breeding a Regional Cultivar.” International Conference on the Science of Botanicals, Oxford MS, April, 2011.

"Phytochemical Analysis of *Actaea racemosa* L. (Black Cohosh) for Identification of Plant Accessions with Desirable Properties for Development of a Regional Cultivar." (Patrick Looney, graduate presenter). Science in the Mountains 2011, Asheville, NC, April, 2011.

"Antitumor Compounds from *Aralia racemosa*." Science in the Mountains 2011, Asheville, NC, April, 2011.

"Antitumor Oplopane Sesquiterpenoids from *Arnoglossum atriplicifolium*." (Kristin Naylor, undergraduate presenter). Science in the Mountains 2011, Asheville, NC, April, 2011.

"Antimicrobial Agent from a *Pseudomonas sp.* Strain from the Great Smoky Mountains National Park." (Rachel Bleich, undergraduate presenter). Science in the Mountains 2011, Asheville, NC, April, 2011.

Phytochemical Investigation of *Eupatorium serotinum* (Late Boneset). (Timothy Willis, graduate presenter) Science in the Mountains 2011, Asheville, NC, April, 2011.

"Isolation and Characterization of Antitumor Compounds from *Arnoglossum atriplicifolium*. (Rachel Bleich, undergraduate presenter). WCU Undergraduate Expo, Cullowhee, NC, March, 2010.

"Antitumor Activity of *Arnoglossum atriplicifolium*." International Conference on the Science of Botanicals, Oxford MS, April, 2009.

"Antitumor activity of *Aralia racemosa*." International Conference on the Science of Botanicals, Oxford MS, April, 2009.

"Phytochemical Analysis of *Croton membranaceous*, a Plant Used in Traditional West African Medicine." Science in the Mountains 2008, Cullowhee, NC, July, 2008.

"New MDM2-Inhibitory Alkaloids from *Lissoclinum badium*." NCI-Frederick Spring Research Festival, Frederick, MD, May, 2007. (Outstanding Poster in Drug Discovery and Development division).

"Bioactive Isomalabaricane Triterpenoids from *Rhabdastrella globostellata* that Stabilize the Binding of DNA Polymerase β to DNA." 47th Annual Meeting of the American Society of Pharmacognosy, Arlington, VA, August, 2006.

"Aminopropyl Bonded Silica for Dereplication of Long-Chain Fatty Acids in Natural Products Drug Discovery." 44th Annual Meeting of the American Society of Pharmacognosy, Chapel Hill, NC, July, 2003.

"Isolation and Identification of a Diterpenoid Alcohol from the Foliage of the Canadian Hemlock (*Tsuga canadensis*)." Undergraduate Meeting in Miniature, 51st Annual Southeastern Regional Meeting of the American Chemical Society, Knoxville, TN, October, 1999.

Publications (* = last five years)

*Pate, S. J.; Clement, J. A.; McCoy, J.-A. H.; Lance, S. L; Mathews, K. G. *AJB Primer Notes & Protocols* **2012** (manuscript submitted).

*Beutler, J. A.; Kang, M.-I.; Robert, F.; Clement, J. A.; Pelletier, J.; Colburn, N. H.; McKee, T. C.; Goncharova, E.; McMahon, J. B.; Henrich, C. J. Quassinoid Inhibition of AP-1 Function Does Not Correlate with Cytotoxicity or Protein Synthesis Inhibition. *J. Nat. Prod.* **2009**, *72*, 503-506.

*Clement, J. A.; Kitagaki, J.; Yang, Y.; Saucedo, C. J.; O'Keefe, B. R.; Weissman, A. M.; McKee, T. C.; McMahon, J. B. Discovery of new pyridoacridine alkaloids from *Lissoclinum* cf. *badium* that inhibit the ubiquitin ligase activity of Hdm2 and stabilize p53. *Bioorg. Med. Chem.* **2008**, *16*, 10022-10028.

*Clement, J. A.; Li, M.; Hecht, S. M.; Kingston, D. G. I. Bioactive Isomalabaricane Triterpenoids from *Rhabdastrella globostellata* that Stabilize the Binding of DNA Polymerase β to DNA. *J. Nat. Prod.* **2006**, *69*, 373-376.

Clement, J.A.; Yoder, B.J.; Kingston, D.G.I. Natural Products as a Source of CNS-active Agents. *Mini-Rev. Org. Chem.* **2004**, *1*, 183-208.

Topçu, G.; Aydogmus, Z.; Imre, S.; Gören, A.C.; Pezzuto, J.M.; Clement, J.A.; Kingston, D.G.I. Brominated Sesquiterpenes from the Red Alga *Laurencia obtusa*. *J. Nat. Prod.* **2003,** *66,* 1505-1508.

Clement, J.A.; Zhou, B.-Z.; Johnson, R.K.; Kingston, D.G.I. Isolation and Characterization of a Tie2 Kinase Inhibitory Sulfated Triterpenoid from a Green Alga of the *Tuemoya* Genus: Complete Assignment of the ^{1}H and ^{13}C Spectra of a Sulfated Triterpenoid Tie2 Kinase Inhibitor. *Magn. Reson. Chem.* **2003** *41*, 644-646.

Paul Hadley Davis, M.S.
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Education:

Western Carolina University, Cullowhee, NC 2006-2008
-Master of Science in Chemistry 2008

Western Carolina University, Cullowhee, NC. 2003-2005
-Bachelor of Science in Chemistry 2005
-SUMMA CUM LAUDE (GPA 3.93/4.00)
-Breese Scholarship for Chemistry 2005
-Brown Family Scholarship for Chemistry 2004

Southwestern Community College, Sylva, NC. 2002
-GPA 4.00/4.00

Calhoun M.E.B.A. Engineering School, Baltimore, MD. 1975-1976
-President of Class

University of Virginia, Charlottesville, VA. 1972-1975, 1977
-DuPont Scholarship

Teaching experience:

Lecturer, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC. 2010-present.

Adjunct Instructor, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC. 2006-2010.

Physics Tutor, Western Carolina University, 2004-2005.

Mathematics Tutor, Western Carolina University, Cullowhee, NC, 2003-2004.

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Email: mhdesilva@wcu.edu

EDUCATION

2003 - 2007	**PhD in Chemistry** (Cumulative GPA **4.00**) University of Arizona, Tucson, AZ Research Advisor: Prof. Zhiping Zheng **Dissertation Research**: *Exploratory Synthesis, Structural Characterization, and Property Investigation of Lanthanide-containing Functional Materials*
1998 - 2001	**B. Sc. in Chemistry** (First Class Honors) University of Kelaniya, Sri Lanka

PROFESSIONAL EXPERIENCE

2010-Present	Assistant Professor of Chemistry, Western Carolina University
2008 – 2010	Research Associate, Chemistry & Biochemistry and Bio5 Institute, University of Arizona (Research Advisors: Prof. Victor J. Hruby (University of Arizona) and Prof. Robert J. Gillies (H. Lee Moffitt Cancer Center, Tampa, FL)
2002 – 2010	Lecturer, University of Kelaniya, Sri Lanka
2007 – 2008	Research Associate, Materials Science & Engineering, University of Arizona (Research Advisor: Prof. L. Rene Corrales)
Summer 2007	Summer Research Fellow, Pacific Northwest National Laboratory (PNNL), Washington (Research Advisor: Dr. Jun Li)
2005 – 2007	Graduate Research Assistant, University of Arizona
2005 – 2007	Chemical Safety Committee, Department of Chemistry, University of Arizona
2003 – 2004	Graduate Teaching Assistant, University of Arizona
2001 – 2002	Assistant Lecturer, University of Kelaniya, Sri Lanka
2000 – 2001	Teaching Assistant, University of Kelaniya, Sri Lanka

HONORS AND AWARDS

2010 Faculty Research & Creativity Award, Western Carolina University, Cullowhee, North Carolina
2009 Victor J. Hruby Fellowship for Outstanding Postdoctoral Research, American Peptide Society
2009 Young Investigators' Travel Award, 21st American Peptide Symposium, Bloomington, Indiana
2008 Front Cover Art Work, J. Phys. Chem. A (Vol. 112, Iss. 20, May **2008**)
2008 Postdoctoral Research Fellowship, Los Alamos National Laboratory (LANL), Los Alamos, New Mexico (declined)
2007 Summer Research Fellowship, Pacific Northwest National Laboratory (PNNL), Richland, Washington
2005 Mid-Career Fellowship, Department of Chemistry, University of Arizona
2004 American Chemical Society Travel Award – Division of Inorganic Chemistry
2004 Galileo Circle Scholarship, College of Science, University of Arizona
2004 Mid-Career Fellowship, Department of Chemistry, University of Arizona
2004 Graduate Teaching Award, Department of Chemistry, University of Arizona
2003 Graduate Teaching Award, Department of Chemistry, University of Arizona
2000 Gold Medal, Department of Chemistry, University of Kelaniya, Sri Lanka
1999 Mitsubishi Scholarship on Undergraduate Studies, Faculty of Science, University of Kelaniya, Sri Lanka

AREAS OF SPECIALIZATION

1. Bioinorganic and Bioanalytical Chemistry
2. Lanthanide-based Materials Chemistry
3. Nanotechnology
4. Material Synthesis
5. Computational Chemistry
6. Nuclear Medicinal Chemistry

JOURNAL REVIEWER

1. Journal of the American Chemical Society
2. Journal of Physical Chemistry
3. European Journal of Inorganic Chemistry
4. Applied Surface Sciences
5. Chemical Physics Letters
   Materials related to lanthanides, X-ray crystallography, absorption & luminescence spectroscopy, and computational chemistry

CONFERENCE REVIEWER

1. Reviewer, International Conference on Chemical Sciences, Institute of Chemistry, Sri Lanka, June, 2012. Section: New Technological Developments and Industrial Research.
2. Reviewer for the Proceedings of the National Conference on Undergraduate Research, April, 2011.

CHEMISTRY COURSE UNITS DESIGNED

"Nanomaterials and Nanotechnology" – Course designed for the undergraduate Chemistry program at the University of Kelaniya, Sri Lanka, December 2008

CHEMISTRY COURSE UNITS TAUGHT

Western Carolina University, Cullowhee, NC, USA
CHEM 132: Survey of Chemistry
CHEM 140: Advanced General Chemistry
CHEM 140: Advanced General Chemistry LAB
CHEM 272: Organic Synthesis LAB
CHEM 321: Inorganic Chemistry
CHEM 472/593: Chemical Syntheses
CHEM 421/593: Advanced Inorganic Chemistry

University of Arizona, Tucson, AZ, USA
CHEM 104a: General Chemistry Laboratory I
CHEM 104b: General Chemistry Laboratory II
CHEM 412: Advanced Inorganic Chemistry LAB (mentor)

University of Kelaniya, Sri Lanka
CHEM 1211: Inorganic Chemistry Laboratory I
CHEM 4063: Advanced Inorganic Chemistry Laboratory
CHEM 4073: Advanced Physical Chemistry Laboratory
CHEM 4092: Analytical and Environmental Chemistry Laboratory
CHEM 1113: General Chemistry
CHEM 2113: Analytical Chemistry

RESEARCH EXPERIENCE

1. Inorganic Chemistry: Development of lanthanide-based materials for biomedical imaging and materials applications, including optical imaging, magnetic

resonance imaging (MRI), single photon emission computed tomography (SPECT) imaging, organic light emitting diodes, near infra-red illuminating devices, and optical telecommunication.

2. Bioinorganic Chemistry: Lanthanide labeling of cell receptor-targeted peptide ligands including the human melanocortin stimulating hormone (MSH), lanthanide-based live cell binding fluoroimmuno assays to study in-cyto ligand-receptor interactions relevant to melanoma and pancreatic cancer
3. Organic Chemistry: Solid-state peptide synthesis
4. Computational Chemistry: Theoretical studies of molecular structures and electronic properties of lanthanide and transition metal complexes using density functional theory (DFT) and time-dependant density functional theory (TDDFT)
5. Environmental Chemistry: Quantitative assessment of fluoride adsorption on kaolinite mineral water interface for the development of a de-fluoridating methodology for ground waters
6. Industrial Chemistry: Study of the aging properties of radiation and sulfur vulcanized natural rubber latex gloves

RESEARCH SKILLS

1. Inorganic synthesis (lanthanide-containing molecular species)
2. Nanotechnology
3. Computational Chemistry Calculations
4. Organic synthesis (solid-state peptide synthesis and lanthanide labeling)
5. Nuclear medicine (metal radio-labeling of pharmacophores for *in vivo* imaging)
6. Live cell *in vitro* binding assays using lanthanide(III)-DOTA and –DTPA complexes based on dissociation enhanced lanthanide fluoroimmunoassay (DELFIA) technology
7. Analytical Techniques including UV-Vis, IR, AAS, ICP, and fluorescence spectroscopy, imaging [transmission electron microscopy (TEM)], GC/MS, differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), X-ray crystallography, nuclear magnetic resonance (NMR), and high pressure liquid chromatography (HPLC)

COMPUTATIONAL SKILLS

1. Computational codes (NWChem, Amsterdam density functional (ADF 2004), Gaussian 03)
2. Softwares (extensible computational chemistry environment (ECCE), MOLEKEL, visual molecular dynamics (VMD), Gauss View, Spartan, Chime, Babel, Mercury, SHELXTL, Diamond)
3. Operating systems (Windows XP, UNIX/Linux)

PROFESSIONAL AFFILIATIONS

1. American Chemical Society (ACS), Division of Inorganic Chemistry
2. American Peptide Society
3. American Ceramic Society
4. Alpha Chi Sigma Professional Chemistry Fraternity (AXE)
5. Advanced Research Institute for Biomedical Imaging (ARIBI), University of Arizona
6. Arizona Imaging & Microanalysis Society (AIMS)
7. Institute of Chemistry, Ceylon (I. Chem. C.)
8. Sri Lankan Association for the Advancement of Science (SLAAS), Sri Lanka

PUBLICATIONS

1. **De Silva, C. R.**; Vagner, J.; Liu, Z.; Wyffels, L.; Gillies, R. J.; Hruby, V. J. "*In vivo* SPECT Imaging of δ-Opioid Receptors using ^{111}In-DOTA Labeled Deltorphin-II Peptide Ligand" *Bioconjugate Chemistry* under revision.

2. Gainer, C. F.; Joshua, G. S.; **De Silva, C. R.**; Romanowski, M. "Control of Green and Red Upconversion in $NaYF4:Yb^{3+}$, Er^{3+} Nanoparticles by Excitation Modulation" *Journal of Materials Chemistry* **2011**, *21*(46), 18530.

3. Barkey, N. M.; Tafreshi, N. K.; Josan, J. S.; **De Silva, C. R.**; Sill, K.; Hruby, V. J.; Gillies, R. J.; Morse, D. L.; Vagner, J. "Development of Melanoma-Targeted Polymer Micelles by Conjugation of an MC1R Specific Ligand" *Journal of Medicinal Chemistry* **2011**, *54*(23), 8078.

4. Josan, J. S.; **De Silva, C. R.**; Vagner, J.; Yoo, B.; Lynch, R.; Pagel, M. D.; Hruby, V.J. "Fluorescent and Lanthanide Labeling for Ligand Screens, Assays, and Imaging" Book Chapter in Drug Design & Discovery *Methods in Molecular Biology-Protocols* **2011**, Vol. 716, Page 89-126 (Ed.) S.D. Satyanarayana Jois, Springer.

5. **De Silva, C. R.**; Vagner, J.; Lynch, R.; Gillies, R. J.; Hruby, V. J. "Optimization of Time-Resolved Fluorescence Assay for Detection of Eu-DOTA-labeled Ligand-Receptor Interactions" *Analytical Biochemistry* **2010,** 398, 15.

6. **De Silva, C. R.**; Smith, S.; Shim, I.; Pyun, J.; Gutu, T.; Jiao, J.; Zheng, Z. "Lanthanide(III)-Doped Magnetite Nanoparticles" *Journal of the American Chemical Society* **2009,** 131, 6336.

7. **De Silva, C. R.**; Musgraves, D. J.; Schneider, Z.; Potter Jr. B. G.; Simmons-Potter, K.; Boyle, T. J.; Corrales, L. R. "Intrinsic Electronic Transitions of the Absorption Spectrum of $(OPy)_2Ti(TAP)_2$: Implications Towards Photostructural Modifications" *Journal of Physical Chemistry A* **2009,** 113, 5598.

8. **<u>De Silva, C.R.</u>**; Li, F.; Huang, C.; Zheng, Z. "Europium β-Diketonates for Red Emitting Electroluminescent Devices" *Thin Solid Films* **2008**, 517, 957.

9. **<u>De Silva, C. R.</u>**; Li, J.; Zheng, Z.; Corrales, L. R. "Correlation of Calculated Excited-state Energies and Experimental Quantum Yields of Luminescent Tb(III) β-diketonates" (<u>with **front cover artwork**</u>) *Journal of Physical Chemistry A* **2008**, 112, 4527.

10. **<u>De Silva, C. R.</u>**; Maeyer, J.R.; Wang, R.; Nichol, G.S.; Zheng, Z. "Adducts of Europium β-diketonates with Nitrogen *p,p'*-disubstituted Bipyridine and Phenanthroline Ligands: Synthesis, Structural Characterization, and Luminescence Studies" *Inorganica Chimica Acta* **2007**, 360, 3543.

11. **<u>De Silva, C. R.</u>**; Maeyer, J. R.; Dawson, A.; Zheng, Z. "Adducts of Lanthanide β - Diketonates with 2,4,6-Tri(2-pyridyl)-1,3,5-triazine: Synthesis, Structural Characterization, and Photoluminescence Studies" *Polyhedron* **2007,** 26 1229-1238.

12. Gan, H.; Li, L.; DeRose, C. T.; Norwood, R. A.; **<u>De Silva, C. R.</u>**; Zheng, Z.; Peyghambarian, N. "A Hybrid Sol-gel Reverse-mesa Waveguide using Lanthanide Phosphate Nanoparticles for Optical Amplification" *SPIE-The International Society for Optical Engineering* **2007,** 6469, 64690B1-64690B8.

13. **<u>De Silva, C. R.</u>**; Wang, R.; Zheng, Z. "Highly Luminescent Novel Eu(III) Complexes with 2,4,6-Tri(2-pyridyl)-1,3,5-triazine Ligand: Synthesis, Structural Characterization, and Photoluminescence Studies" *Polyhedron* **2006**, 25, 3449-3455.

14. Gan, H.; Norwood, R. A.; Li, L.; DeRose, C. T.; Wu, J.; Thomas, J.; Fardad, M. A.; Schuelzgen, A.; Peyghambarian, N. N.; **<u>De Silva, C. R.</u>**; Zheng, Z. "Lanthanide Nanoparticle Doped Low-Loss Sol-Gel Amplifier Materials" *SPIE-The International Society for Optical Engineering* **2005**, *5935*, 105-114.

15. **<u>De Silva, C. R.</u>**; Wang, J.; Carducci, M. D.; Rajapakshe, S. A.; Zheng, Z. "Synthesis, Structural Characterization, and Luminescence Studies of a Novel Europium(III) Complex [Eu(DBM)$_3$(TPTZ)]" *Inorganica Chimica Acta* **2004**, *357*, 630-634.

PRESENTATIONS

1. Martin, C. M.; **<u>De Silva, C. R.</u>**; Gainer, C. F.; Dougherty, A. E.; Romanowski, M.; Pike, R. D. "Preparation and Time-resolved Luminescence Studies of Novel Lanthanide Complexes and Their Sol-gel Materials" 63rd Southeastern Regional Meeting- American Chemical Society (SERMACS), Richmond, Virginia, USA, October 26-29, **2011**, SERM-581.
2. **<u>De Silva, C. R.</u>** "DFT study of Lanthanide (III) β-diketonates: Correlation of Calculated Excited States and Experimental Luminescence Intensities" 63rd

Southeastern Regional Meeting- American Chemical Society (SERMACS), Richmond, Virginia, USA, October 26-29, **2011**, SERM-499.

3. Runken, L. B.; **De Silva, C. R.** "Lanthanide-Based Nanomaterials with Enhanced Luminescence and Magnetic Properties for Biomedical Imaging Applications" *Undergraduate Expo*, Western Carolina University, Cullowhee, NC, USA, March, **2011**.

4. Runken, L. B.; Martin, L.C.; Gainer, C.; Romanowski, M.; **De Silva, C. R.** "Lanthanide-Based Nanomaterials with Enhanced Luminescence and Magnetic Properties for Biomedical Imaging Applications" poster presentation at the National Conference for Undergraduate Research (NCUR), Ithaca College, NY, USA, April, **2011**.

5. **De Silva, C.R.**; Liu, Z.; Vagner, J.; Gillies, R. J.; Hruby, V. J.; Furenlid, L. R.; Barrett, H. H.; Woolfenden, J. M. "Targeting of δ-opioid receptors in xenografted colon cancer using ^{111}In-labeled deltorphin II ligand" SNM abstract (Advancing Molecular Imaging and Theory) Annual Meeting, Salt Lake City, UT, USA, **2010**.

6. **De Silva, C. R.**; Vagner, J.; Liu, Z.; Gillies, R. J.; Hruby, V. J. "^{111}In-Labeled Deltorphin II Targeting the δ-Opioid Receptor for SPECT Imaging" 239th ACS National Meeting, San Francisco, CA, USA, March **2010**.

7. **De Silva, C. R.**; Vagner, J.; Lynch, R.; Gillies, R. J.; Hruby, V. J. "Lanthanide-based time-resolved luminescence assays for detection of ligand-receptor interactions" Advanced Research Institute for Biomedical Imaging (ARIBI) Workshop, University of Arizona, Tucson, AZ, USA, 85721, October **2009**.

8. Gainer, C.; **De Silva, C. R.**; Romanowski, M. "Augmented Microscopy: NIR luminescence and lifetime measurements for imaging" Advanced Research Institute for Biomedical Imaging (ARIBI) Workshop, University of Arizona, Tucson, AZ, 85721, USA, October **2009**.

9. **De Silva, C. R.**; Vagner, J.; Lynch, R.; Gillies, R. J.; Hruby, V. J. "Development of an europium-DOTA based luminescence assay for the detection of ligand-receptor interactions" 21st American Peptide Symposium, Bloomington, Indiana, USA, June **2009**.

10. Vagner, J.; Chung, W. J.; Weber, C. S.; Limesand, S. W.; **De Silva, C. R.**; Lynch R. "Heterobivalent ligands crosslink multiple receptors for targeting of pancreatic β-cells to monitor β-cell mass" 21st American Peptide Symposium, Bloomington, Indiana, USA, June **2009**.

11. **De Silva, C. R.**; Vagner, J.; Lynch, R.; Gillies, R. J.; Hruby, V. J. "Lanthanide-DOTA based luminescence assays for the detection of ligand-receptor interactions" Advanced Research Institute for Biomedical Imaging (ARIBI) Workshop, University of Arizona, Tucson, AZ, USA, 85721, March **2009**.

12. Gainer, C.; **De Silva, C. R.**; Hruby, V. J.; Romanowski, M. "Lifetime resolved imaging with a wide field microscope" Advanced Research Institute for Biomedical Imaging (ARIBI) Workshop, University of Arizona, Tucson, AZ, USA, 85721, March **2009**.

13. **De Silva, C. R.**; David Musgraves, Z. Schneider, L. Rene Corrales, B.G. Potter, K. Simmons-Potter, T. J. Boyle "Theoretical Investigation of Electronic Properties of Ti-alkoxides towards Photostructural Modifications" Glass and Optical Division Meeting (GODM), American Ceramic Society, Tucson, AZ, USA, May **2008**.

14. **De Silva, C. R.** "Investigation of Luminescent Lanthanide Complexes using Time-dependant Density Functional Theory (TDDFT)" Department of Chemistry, University of Arizona, USA, October **2007**.

15. **De Silva, C.R.**; Smith, S.P.; Zheng Z. "Lanthanide Doped Fe Nanoparticles: Exploratory Synthesis and Property Investigation" 19th Rocky Mountain ACS Regional Meeting, Tucson, AZ, USA, October **2006.**

16. **De Silva, C. R.** "Lanthanide-containing Materials for Optical Applications" Department of Chemistry, University of Arizona, USA, February **2006**.

17. **De Silva, C. R.** "Development of Novel Lanthanide Complexes for Electroluminescent Applications" Department of Chemistry, University of Arizona, USA, November **2005**.

18. **De Silva, C. R.**; Cole, J. R.; Zheng, Z. "Novel Lanthanide Complexes with Potentially Enhanced Electroluminescent Properties" 227th ACS National Meeting, Anaheim, CA, USA, March **2004**.

19. **De Silva, M.H.C.R.;** Pathiratne K.A.S.; Weerasuriya, S.V.R. "Quantitative Assessment of Surface Parameters and Environmental Conditions for Adsorption of Fluoride on Kaolinite Mineral Chemistry in Sri Lanka" *Institute of Chemistry*, Vol: 19, No: 2, **2002** Sri Lanka.

20. Pathiratne, K.A.S.; Weerasooriya, S.V.R.; **De Silva, M.H.C.R.** **"**Quantitative assessment of fluoride adsorption on kaolinite mineral-water interface for the development of a defluoridating methodology for ground waters" *SLAAS Proc.* (Sri Lanka Association for the Advancement of Science) E2, 256, **2001** Sri Lanka.

SERVICES

1. Performing Chemistry Magic Shows at elementary and middle schools.
2. Science Fair Judge at the Western Regional Science Fair.
3. Proctoring middle school end of year examinations (Cullowhee Valley School).
4. Science Fair Judge at the Cullowhee Valley School, Cullowhee, NC.
5. Graduate Thesis Advising Committees, Western Carolina University.
6. Curriculum Committee, Department of Chemistry & Physics, Western Carolina University, Cullowhee, NC.
7. Musical Performance for Western Carolina University during the International Festival and Employee Appreciation Day.
8. Laboratory Safety Committee, University of Arizona, Tucson, AZ.

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Cullowhee, NC

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Brian Dinkelmeyer

Education

1993- 1999 SUNY Stony Brook Stony Brook NY
Ph.D./Organic Chemistry

Thesis: Applications in Crystal Engineering: The Use of Hydrogen-Bonding Functionality to Organize 2-Substituted 1,3-Butadienes for Topochemical Polymerization. Hydrogen Bonding Diacetylene Containing Macrocycles as a Strategy for Constructing Open Frame Networks.

1988 – 1993 SUNY Oswego Oswego NY
B.S./Biochemistry; B.A./Biology

Teaching Experience

2001-present:
Assistant Professor Western Carolina University
Courses Taught:
- CHEM132: General Chemistry
- CHEM140: Honors General Chemistry Laboratory
- CHEM140: General Chemistry Laboratory
- CHEM241:Organic Chemistry I
- CHEM242:Organic II
- CHEM272: Organic Laboratory
- CHEM372: Synthesis
- CHEM380: Undergraduate Research
- CHEM 442/542/694: Polymers

2000-2001:
Visiting Assistant Professor Kenyon College Gambier OH
Teaching Responsibilities:

Fall 2000: Three sections of Organic Laboratory: Pre-lab lectures, demonstrations and laboratory supervision
Spring 2001: Three sections of Organic Laboratory: Conversion of laboratory form microscale to macroscale. Design of new experiments, Pre-lab lectures, demonstrations and laboratory supervision.
Guest Lecturing for Second Semester Organic Lecture.
Summer 2001: *Summer Science Scholars Program*. Competitive Awards for Student-Faculty Research Teams in the Laboratory Sciences.

1997, 1999: *Teaching Assistant*: Honors General Chemistry Laboratory.
SUNY Stony Brook

1995: *Teaching Assistant*: Organic Chemistry Laboratory.
SUNY Stony Brook

1994: *Teaching Assistant*: Organic Chemistry. SUNY Stony Brook.
1993: *Teaching Assistant*: General Chemistry. SUNY Stony Brook

Research Experience

September 2001-present:
Mentor/mentored three MS students
Mentored/mentor 15 undergraduate researchers. ~3/semester.

May 2001-July2001: *Summer Science Scholars Program*. Research with two student assistant/mentors. Research Focus: Project 1: Developing a novel topochemical polymerization of compounds containing butadiene functionality. Project2: Studying the effect of N-substituents on the chemistry of Indole- toward the formation indole alkaloids containing vicinal stereocenters.
1999-2000: Postdoctoral research under Professor Mark M. Hollingsworth. Research focus: The study of the ferroelastic and ferroelectric properties of urea inclusion compounds and t-butyl calix[4]arene inclusion compounds by the complimentary methods of optical microscopy and single crystal X-ray diffraction.
1994-1999: Graduate research under Professor Frank W. Fowler and Professor Joseph W. Lauher. Research focus: The rational design of organic solids from the analysis of molecular structure. Applying principles of supramolecular synthesis to prepare open framed networks and control solid state reactivity.

Skills

Synthesis of novel organic compounds. Handling of air-sensitive reagents. Purification by recrystallization, flash column chromatography, and distillation. Expertise in organic crystal growth. Instrumentation: NMR, FTIR, UV/Vis, MALDIToF, DSC, GC, microscopic photography and videography and single crystal X-ray diffraction using ENRAF CAD4A Nonius and SiemanSMART CCD diffractometers. Computer skills: Efficient with Windows 98 and Windows NT. Familiar with UNIX, MS Word, Excel, Cambridge Structural Database, Conquest, ShellX, Cerius2, Spartan, Macromodel 4.0 and Macromodel 6.5 modeling programs. Simple Web page design.

Publications

I have written problems for the physical science section for the text: "*The Best Test Preparation for the MCAT Medical College Admission Test.*"Research and Education Association. Test Preps.

Non-topochemical Motion During a Phase Transition in a Ferroelastic Inclusion Compound. Mark Hollingsworth, Matthew Peterson, Kevin Pate, Brian Dinkelmeyer, Michael Brown. *JACS* **2002**, V.124, No.10, 2094.

Designed 2-Substituted Butadiene Structures. Dinkelmeyer, Brian; Fowler, Frank W.; Lauher, Joseph W. *Mol. Cryst. Liq. Cryst.,* **1998**, 313, 259-264.

The Design of Molecular Solids: The Utility of the Hydroxyl Functionality as a Predictable Design Element. Nguyen, Tam; Scott, Aaron; Dinklemeyer, Brian: Fowler, Frank W.; Lauher, Joseph W. *New J. Chem.,* **1998**, 313,253-258.

Presentations

Topochemical Polymerizations. CHEM495 Seminar, Western Carolina University, NC, 2001.

Mechanism and Control of Ferroelastic Phase Transitions in Urea Inclusion Compounds Containing α,ω-Disubstituted Hexanes. Midwestern Solid State Organic Symposia XI, Purdue University, West Lafayette, IN, 2000

Solid State Reactivity of Ureylene and Oxalylamide Compounds containing 2-Substituted Butadiene Functionality. Gordon Research Conference- Chemistry of Supramolecules and Assemblies, New England College, Henniker, NH, 1999.

Crystal Engineering: The Importance of Persistent Molecular Symmetry. American Crystallographic Association Annual Meeting, Arlington, VA, 1998.

The Topochemical Reactivity of 2-Substituted Butadiene Structures. ICOSS XIII, Stony Brook, NY, 1997.

Designed 2-Substituted Butadiene Structures. New York Academy of Science, NYC, NY, 1996.

Presentations by Students Researchers

Heather Reichlin: Solid State Reactions. National Conference for Undergraduate Research, Salt Lake City, UT.
MattWilliams: Polymorphism in N,N' (methylpyridyl)Oxalamide: muconic acid cocrystals. National Conference for Undergraduate Research, Salt Lake City, UT.

Tysuke Sumiyoshi: Cis-Trans Isomerzation of Muconic Acid Co-crystals. National Conference for Undergraduate Research, Indianapolis, IN 2004.
Mike Young SERMACS 2005 Poster
Steven Rogers SERMACS 2005 Poster
Selenea Famliagetti SERMACS 2005 Poster
Wesley Whitfield SEMACS 2006 Poster
Kyle Beard SERMACS November 2007 Poster
Chris Steddum SERMACS November 2011 Oral

Awards received

1993-1996, GAAN fellowship from the Department of Education

Grants

Funded

PRF-type G (35,000$) "Studying the structural Parameters Important for the Topochemical Polymerization of Butadienes."

Microgrant(500$)-Computational Modeling in Science and Engineering Education. Funds were used to attend a workshop on incorporating computational modeling in the curriculum.

Summer Research Fellowship(1500$) for writing an external grant proposal.

Professional memberships

American Chemical Society, 1993-present.
Council on Undergraduate Research, 2000-present.

Research Interests

Organic Synthesis, Natural Products, Topochemical Reactions, Materials, Construction of novel Supramolecular architectures, Crystallography.

DAVID D. EVANOFF, JR., PH.D.

325A Natural Sciences Building ▪ Cullowhee, NC 28723 ▪ (828) 227-2829 ▪ devanoff@email.wcu.edu

RESEARCH INTERESTS AND EXPERTISE

Optical and optoelectronic properties of materials: fabrication of organic electronic devices; electroluminescent polymer synthesis and characterization; metal and dielectric nanoparticle, as well as nanocomposite synthesis and characterization. *Electronic and vibrational spectroscopy:* Development of novel substrates and measurement systems to maximize the effect of surface enhancement in Raman Spectroscopy; determination of fundamental optical constants of metal nanoparticles.

EDUCATION

DOCTOR OF PHILOSOPHY IN ANALYTICAL CHEMISTRY — **December 22, 2005**
Clemson University — Clemson, South Carolina
GPA: 3.77/4.00 — Advisor: Professor George Chumanov
Dissertation: Synthesis and Optical Properties of Metal Nanoparticles and Nanocomposite Materials

ACS CERTIFIED BACHELOR OF SCIENCE IN CHEMISTRY — **May 19, 2001**
Westminster College — New Wilmington, Pennsylvania
GPA: 3.60/4.00 *(cum laude)* — Advisor: Dr. Timothy T. Wooster
Thesis: Synthesis and Characterization of Cobalt Cage Complexes for Electrochemical Applications

PROFESSIONAL EXPERIENCE

ASSISTANT PROFESSOR OF ANALYTICAL CHEMISTRY — **August 2008 – Present**
Department of Chemistry and Physics — Cullowhee, North Carolina
Western Carolina University — Chair: Dr. Cynthia A. Atterholt

RESEARCH ASSISTANT PROFESSOR / ANALYTICAL SERVICES MANAGER — **August 2007 – July 2008**
Center for Optical Materials Science and Engineering Technologies — Anderson, South Carolina
Clemson University — Director: Professor John Ballato

RESEARCH ASSOCIATE/RESEARCH ASSISTANT PROFESSOR — **December 2005 – August 2007**
School of Material Science and Engineering — Anderson, South Carolina
Clemson University — Advisor: Professor Stephen H. Foulger

COURSES TAUGHT

WESTERN CAROLINA UNIVERSITY: CHEM139: General Chemistry I, CHEM 232: Quantitative Analysis, CHEM370: Instrumental Analysis I, CHEM380: Undergraduate Research, CHEM493/593: Fundamentals of Spectroscopy, CHEM696: Graduate Seminar, CHEM 698: Graduate Research.

AWARDED FUNDING

$306,175.00 — **September 2010 – August 2013**
Major Research Instrumentation Award — National Science Foundation
- *Title:* MRI: Acquisition of a Raman Microscope for Undergraduate Research and Education

$45,000.00 (INCLUDING $10,000.00 WCU MATCH) — **July 2010 – June 2012**
Cottrell College Science Award — Research Corporation for Scientific Advancement
- *Title:* Synthesis and characterization of silver core-dielectric spacer-metal shell nanoparticles and their application to surface enhanced spectroscopy

$5,000.00 — **July 2009 – June 2010**
Faculty Research and Creative Activities Grant — Western Carolina University
- *Title:* Plasmonic fluorescence enhancement of poly(3-hexylthiophene) for organic solar cell applications

$70,000.00 **November 2007**

COMSET Research Infrastructure Award Clemson University

- *Title:* Acquisition of a Simultaneous Thermal Analyzer coupled with Mass Spectrometer for Advanced Materials Research and Education
- Internal competition among COMSET researchers for portion of a $300,000.00 award from South Carolina

PUBLICATIONS

REFEREED JOURNALS

12. S. W. Huffman, A. L. Salido, D. D. Evanoff, Jr., Quantitative Infrared Spectroscopy in the undergraduate Laboratory via Multivariate Mixture Analysis of a Simulated Analgesic, *Spectroscopy Letters*, in press.
11. D. D. Evanoff, Jr., J. R. Lawrence, C. F. Huebner, J. M. Houchins, B. J. Stevenson, A. L. Foguth, J. B. Carroll, S. H. Foulger, Copolymers of 2-(9H-carbazol-9-yl)ethyl 2-methylacrylate and 4-[5-(4-tert-butylphenyl)-1,3,4-oxadiazol-2-yl]phenyl-2-methylacrylate: Correlating hole drift mobility and electronic structure calculations with electroluminescence. *ACS Applied Materials & Interfaces,* **2009**, 1, (4), 875.
10. D. D. Evanoff, Jr., J. B. Carroll, R. D. Roeder, Z. J. Hunt, J. R. Lawrence, S. H. Foulger, Poly(methyl methacrylate) Copolymers Containing Pendant Carbazole and Oxadiazole Moieties for Applications in Single-Layer Organic Light Emitting Devices, *J. Polym. Sci. A.*, **2008**, *46*, 7882.
9. B. Kokuoz, J. R. DiMaio, C. J. Kucera, D. D. Evanoff, Jr., J. Ballato, Color Kinetic Nanoparticles, *J. Am. Chem. Soc.*, **2008**, *130*, 12222.
8. C. F. Huebner, J. B. Carroll, D. D. Evanoff, Jr., Y. Ying, B. J. Stevenson, J. R. Lawrence, J. M. Houchins, A. L. Foguth, S. H. Foulger, Colloidal Electroluminescence: Color Control through Particle Mixing, *J. Mater. Chem.* **2008**, *18*, 4942; ***this work was featured on the issue cover***
7. D. D. Evanoff, Jr., S. E. Hayes, Y. Ying, G. H. Shim, J. R. Lawrence, J. B. Carroll, R. D. Roeder, J. M. Houchins, C. F. Huebner, S. H. Foulger, Functionalization of Crystalline Colloidal Arrays Through Click Chemistry, *Adv. Mater.*, **2007**, *19*, 3507; ***this work was featured on the issue cover***
6. D. D. Evanoff, Jr., J. K. Daniels, T. P. Caldwell, K. A. Christensen, G. Chumanov, Monitoring the Germination of a Single *Bacillus subtilis* Endospore via Surface Enhanced Raman Microscopy, *J. Am. Chem. Soc.*, **2006**, *128(39)*, 12618.
5. D. D. Evanoff, Jr., P. Zimmerman, G. Chumanov Synthesis of Metal-Teflon AF Nanocomposites by Solution-Phase Methods, *Adv. Mater.*, **2005**, *17(15)*, 1905.
4. D. D. Evanoff, Jr., G. Chumanov Synthesis and Optical Properties of Silver Nanoparticles and Arrays **(invited review)**, *ChemPhysChem*, **2005**, *6(7)*, 1221.
3. D. D. Evanoff, Jr., G. Chumanov Size-Controlled Synthesis of Nanoparticles: II. Measurement of Extinction, Scattering, and Absorption Cross Sections, *J. Phys. Chem. B*, **2004**, *108(37)*, 13957.
2. D. D. Evanoff, Jr., G. Chumanov Size-Controlled Synthesis of Nanoparticles: I. 'Silver-Only' Aqueous Suspensions via Hydrogen Reduction, *J. Phys. Chem. B*, **2004**, *108(37)*, 13948.
1. D. D. Evanoff, Jr., R. L. White, G. Chumanov Measuring the Distance Dependence of the Local Electromagnetic Field from Silver Nanoparticles, *J. Phys. Chem. B*, **2004**, *108(5)*, 1522.

CONFERENCE PROCEEDINGS

15. R. D. Roeder, D. D. Evanoff, Jr., S. H. Foulger, Piecewise fabrication of click functionalized core-shell particles, *Proceedings of the SPIE: Organic Photonic Materials and Devices XII*, **2010**, *7599*, 75990A.
14. D. D. Evanoff, Jr., V. Tsyalkovsky, A. L. Foguth, P. Rungta, S. H. Foulger, Effect of pendant group structure on the electron mobility and luminescence of oxadiazole-containing polymers, *ACS Polymer Preprints,* **2008**, *49*, 966.
13. C. F. Huebner, D. D. Evanoff, Jr., S. H. Foulger, Electroluminescence with colloidal particles, *ACS Polymer Preprints,* **2008**, *49*, 968.
12. A. L. Foguth, P. Rungta, V. Tsyalkovsky, D. D. Evanoff, Jr., S. H. Foulger, Synthesis of methyl methacrylate-based monomers containing oxadiazole pendant groups, *ACS Polymer Preprints,* **2008**, *49*, 1016.

11. V. Tsyalkovsky, D. D. Evanoff, Jr., Z. J. Hunt, S. H. Foulger, Poly(propargyl acrylate) colloids with hole-transporting polymer brush, *ACS PMSE Preprints,* **2008**, *99*, 176.
10. C. F. Huebner, D. D. Evanoff, Jr., S. H. Foulger, Fabrication of colloid based, color tailored printed organic light emitting diodes, *ACS Polymer Preprints*, **2008**, *49*, 251.
9. Z. J. Hunt, R. D. Roeder, D. D. Evanoff, Jr., S. H. Foulger, Synthesis of functionalized poly(propargyl acrylate) colloids utilizing ATRP and Click chemistry, *ACS Polymer Preprints*, **2008**, *49*, 617.
8. D. D. Evanoff, Jr., J. R. Lawrence, G-H Shim, R. D. Roeder, P. Jiang, Y. Ying, S. H. Foulger, Application of Polymerized Crystalline Colloidal Arrays to Organic Lasing Technologies, *IEEE Xplore*, in press.
7. C. F. Huebner, D. D. Evanoff, Jr., J. R. Lawrence, J. B. Carroll, J. M. Houchins, Y. Ying, S. H. Foulger, Materials engineering and fabrication of colloidally based, color tailorable organic light emitting devices, *ACS Polymer Preprints*, **2007**, *48*, 211.
6. D. D. Evanoff, Jr., S. E. Hayes, Y. Ying, G. H. Shim, J. R. Lawrence, J. B. Carroll, R. D. Roeder, J. M. Houchins, C. F. Huebner, S. H. Foulger, Functionalization of Crystalline Colloidal Arrays Through Click Chemistry, *ACS Polymer Preprints*, **2007**, *48*, 163.
5. D. D. Evanoff, Jr., J. B. Carroll, J. R. Lawrence, J. M. Houchins, R. D. Roeder, C. F. Huebner, S. E. Hayes, Z. J. Hunt, S. H. Foulger, Electroluminescence of poly(methyl methacrylate)-based random copolymers containing carbazole and oxadiazole pendant groups, *ACS Polymer Preprints*, **2007**, *48*, 151.
4. J. Norton, M-G Han, P. Jiang, D. D. Evanoff, Jr., S. E. Creager, S. H. Foulger, Electrochemical tuning of the optical properties of crystalline colloidal arrays composed of poly(3,4-ethylenedioxythiophene)-coated silica particles, *ACS Polymer Preprints*, **2007**, *48*, 45.
3. J. R. Lawrence, D. D. Evanoff, Jr. Y. Ying, P. Jiang, S. H. Foulger, Crystalline colloidal arrays: applications in organic lasers, *Proc. SPIE*, **2007**, 646211/1-646211/5
2. D. D. Evanoff, Jr., G. Chumanov, I. Luzinov, V. Klep, B. Zdyrko, W. Conley, P. Zimmerman, Nanocomposite Liquids for 193 nm Immersion Lithography: a Progress Report, *Proc. SPIE*, **2005**, *5753*, 847. *(cited 2 times)*
1. I. Luzinov, V. Klep, B. Zdyrko, G. Chumanov, D. D. Evanoff, Jr., P. A. Zimmerman, Nanocomposite polymer pellicles for 157 nm photolithography, *ACS PMSE Preprints*, **2005**, *92*, 144.

PATENTS

C. F. Huebner, D. D. Evanoff, Jr., J. B. Carroll, S. H. Foulger, Color-tailored polymer light emitting diode including emissive colloidal particles and method of forming same, *United States Patent filed October 8, 2008, Serial Number: 12/247,270*.

PRESENTATIONS

TALKS

7. "Plasmonic Fluorescence Enhancement of poly(3-hexylthiophene) for Organic Solar Cell Applications," *Pittsburgh Conference & Exhibition*, Orlando, FL, March 2010.
6. "Synthesis of polystyrene colloidal particles loaded with rare-earth doped inorganic nanoparticles and characterization of the resulting photoluminescent polymerized crystalline colloidal arrays," *235th National ACS Meeting*, New Orleans, LA, April 2008.
5. "Application of Polymerized Crystalline Colloidal Arrays to Organic Lasing Technologies," *4th International Symposium on 'High Capacity Optical Networks and Enabling Technologies*,' Dubai, UAE, November 2007.
4. "Polymer Nanocomposites: Applications from Light Emitting Diodes to Organic Lasers," *Hitachi High Technologies America: Windows on the Nano World II*, Anderson, SC, October 2007.
3. "Functionalization of Crystalline Colloidal Arrays through Click Chemistry," *234th National ACS Meeting*, Boston, MA, August 2007.
2. "Electroluminescence of poly(methyl methacrylate)-based random copolymers containing carbazole and oxadiazole pendant groups," *234th National ACS Meeting*, Boston, MA, August 2007.
1. "Crystalline colloidal arrays: applications from sensors to organic lasers," *Photonics West,* San Francisco, CA, January 2007 (*invited talk*).

Posters

8. "Monitoring the Germination of a Single *Bacillus subtilis* Endospore via Surface Enhanced Raman Microscopy," *234th National ACS Meeting*, Boston, MA, August 2007.
7. "Electrochemical tuning of the optical properties of crystalline colloidal arrays composed of poly(3,4-ethylenedioxythiophene)-coated silica particles," *233rd National ACS Meeting*, Chicago, IL, August 2007.
6. "Optical Properties of Plasmon-coupled 2D Arrays of Gold Nanoparticles," *230th National ACS Meeting*, Washington, DC, August 2005.
5. "One- and two-step methods for the solution phase synthesis of Metal-Teflon AF Nanocomposites," *229th National ACS Meeting*, San Diego, CA, March 2005.
4. "SERS Detection of Marine Toxins," *229th National ACS Meeting*, San Diego, CA, March 2005.
3. "Novel Synthesis of Silver Nanoparticles and Measurement of Extinction, Absorption, and Scattering Cross Sections," *228th National ACS Meeting*, Philadelphia, PA, August 2004.
2. "Measuring the Distance Dependence of the Local Electromagnetic Field from Silver Nanoparticles," *Optics in the Southeast, OSA regional meeting*, Orlando, FL, November 2003.
1. "The Synthesis and Characterization of Cobalt Cage Complexes for Electrochemical Applications," *National Conference on Undergraduate Research*, Lexington, KY, March 2001.

Professional Affiliations

- American Chemical Society (ACS), member since 2002
- Society of Applied Spectroscopy (SAS), member since 2010
- Council for Undergraduate Research (CUR), member since 2010

Professional Service

- WCU Institutional Liaison for the Council for Undergraduate Research
- Technical reviewer for Journals: *Plasmonics*, *Chemistry of Materials, Journal of Physical Chemistry, Spectroscopy Letters, Biomacromolecules*
- Technical reviewer for proposals: Kentucky Science & Engineering Foundation

Department/University Service

- Spring 2010 – Present: Maintains departmental website
- Fall 2009 – Spring 2010: Biochemistry faculty search committee
- Fall 2009 – Present: Instructional equipment & supplies committee (chair)
- Fall 2009 – Present: Departmental Curriculum committee
- Fall 2008 – Fall 2009: Collegial Review Document drafting committee
- Fall 2008 – Present: Departmental instrumentation specialist (all shared instrument repair, calibration, and training)

Carmen L. Huffman, Ph.D.

Western Carolina University
Department of Chemistry and Physics
Cullowhee, NC 28723

(828)227-3682 (phone)
(828)227-7393 (fax)
chuffman@wcu.edu

Education

Aug 2001 - Aug 2005	**University of Maryland**, College Park, MD Department of Chemistry and Biochemistry *Ph.D. Chemistry*, Thesis: The role of charge in solvation at liquid/liquid interfaces
Aug 1997 - May 2001	**University of Rhode Island**, Kingston, RI Department of Chemistry *B.S. Chemistry*, Area of focus: organic chemistry, thermochromic properties of alkyl-substituted polythiophenes

Professional Experience

Aug 2006 - present	**Western Carolina University**, Cullowhee, NC Department of Chemistry and Physics *Assistant Professor* Courses taught: introductory chemistry lecture and laboratory, physical chemistry (all areas) lecture and laboratory Other duties: introductory chemistry laboratory coordination
Jan 2006 - Aug 2006	**Western Carolina University**, Cullowhee, NC Department of Chemistry and Physics *Visiting Assistant Professor* Courses taught: introductory chemistry lecture, physical chemistry (thermodynamics) lecture and laboratory
Aug 2005 - Dec 2005	**Western Carolina University**, Cullowhee, NC Department of Chemistry and Physics *Visiting Instructor* Courses taught: introductory chemistry lecture and laboratory Other duties: introductory chemistry laboratory coordination
Jan 2003 - May 2004	**University of Maryland**, College Park, MD Department of Chemistry and Biochemistry *Mentor* of 4 undergraduate student researchers

Aug 2004 - Dec 2004 & Aug 2003 - Dec 2003	**University of Maryland**, College Park, MD Department of Chemistry and Biochemistry *Private Tutor* for physical chemistry
Aug 2001 - Dec 2003	**University of Maryland**, College Park, MD Department of Chemistry and Biochemistry *Teaching Assistant* Courses taught: Physical chemistry discussion (quantum mechanics and kinetics, Fall 2003), physical chemistry laboratory (thermodynamics, Spring 2002 - Spring 2003), introductory chemistry laboratory (Fall 2001)
Jan 2001 - May 2001	**University of Rhode Island**, Kingston, RI Department of Chemistry *Teaching Assistant* Course taught: Organic chemistry laboratory
Jan 1999 - Dec 2000	**University of Rhode Island**, Kingston, RI Department of Chemistry *Chemical Stockroom Assistant* Duties: Receive packages, track inventory, catalog and handle hazardous waste, retrieve and dispense chemicals for researchers, prepare solutions and reagents for teaching laboratories, attend safety committee meetings

Grants & Fellowships

2011	Undergraduate Projects Grant: "Supramolecular chemistry: Crown ether complexes and their unique bonding"[1] Honors College, Western Carolina University ($223)
2010	Chancellor's Travel Award: "Binding affinities of crown-type macrocycles with protonated primary amines" (These funds were used to travel to a *national* meeting.) Office of the Chancellor, Western Carolina University ($1,000)
2007	Undergraduate Projects Grant: "Ions at the air/water interface: Inhibition or enhancement of neutral solute absorption?"[2] Honors College, Western Carolina University ($495)
2007	Chancellor's Travel Award: "Ions at the air/water interface: Inhibition or enhancement of neutral solute absorption?" (These funds were used to travel to a *national* meeting.) Office of the Chancellor, Western Carolina University ($1,000)

[1] Under my direction, this proposal was co-written by and awarded to Melissa Williams and Richard Overstreet, two undergraduate research students.
[2] Under my direction, this proposal was written by and awarded to Kelly Lawrence, an undergraduate research student.

2006 Provost's Instructional Improvement Grant: "Demonstrating Chemical Concepts"
Office of the Provost, Western Carolina University ($500)

2004 Fellowship: "Seeing is believing"
Howard Hughes Medical Institute and the College of Life Sciences, University of Maryland

2003 Jacob K. Goldhaber Travel Grant
Research Graduate School Finance Office, University of Maryland

2003 Rollinson Graduate Mentor Fellowship
College of Life Sciences, University of Maryland (for mentoring of undergraduate research in chemistry)

2002 Gilbert Castellan Fellowship
Department of Chemistry and Biochemistry, University of Maryland

2001 Block Grant Fellowhip
Department of Chemistry and Biochemistry, University of Maryland

2000 Sensors and Surface Technology Partnership Fellowship
University of Rhode Island

1999 Undergraduate Grant
Undergraduate Materials Research Initiative, University of Rhode Island

1999 Undergraduate Research Grant
Office of the Provost, the Sea Grant Office, & the Honors Program, University of Rhode Island

Awards & Honors

2004 James M. Stewart Excellence in Teaching Award
Department of Chemistry and Biochemistry, University of Maryland

2001 Outstanding Undergraduate Student
Rhode Island Section of the American Chemical Society

2001 Outstanding Research Project (1^{st} Prize)
Annual Sensors and Surface Technology Partnership Poster Session
Sensors and Surface Technology Partnership, University of Rhode Island

2000 Chemistry Department Award
Department of Chemistry, University of Rhode Island

1998 National Society of Collegiate Scholars (an honor society), became invited member

1997 Phi Eta Sigma (an honor society), became invited member

Refereed Publications

Prior to 2006, articles were published under my maiden name, Beildeck.

1. Carmen L. Huffman Designing undergraduate research projects that benefit both students and faculty. *MountainRise*, Submitted October 2011.

2. Carmen L. Huffman, Melissa Lee Williams, D. Michelle Benoist, Richard E. Overstreet, and Emily E. Jellen-McCullough. Dependence of collision- induced dissociation energy on molecular degrees of freedom as a means to assess relative binding affinity in multivalent complexes. *Rapid Communications in Mass Spectrometry*, 25:2200–2306, 2011.

3. Carmen L. Beildeck, Milton J. Liu, Michael R. Brindza, and Robert A. Walker. Solvation of p-nitrophenol at a water/alkane interface: The role of ionic strength and salt identity. *Journal of Physical Chemistry B*, 109(30):14604–14610, 2005.

4. C. L. Beildeck, W. H. Steel, and R. A. Walker. Surface charge effects on solvation across liquid/liquid and model liquid/liquid interfaces. *Faraday Discussions*, 129:69–80, 2005.

5. William H. Steel, Carmen L. Beildeck, and Robert A. Walker. Solvent polarity across strongly associating interfaces. *Journal of Physical Chemistry B*, 108(41):16107–16116, 2004.

6. William H. Steel, Yuen Y. Lau, Carmen L. Beildeck, and Robert A. Walker. Solvent polarity across weakly associating interfaces. *Journal of Physical Chemistry B*, 108(35):13370–13378, 2004.

7. Carmen L. Beildeck, William H. Steel, and Robert A. Walker. Cationic molecular rulers: Synthesis, characterization, and intramolecular complications. *Langmuir*, 19(12):4933–4939, 2003.

Seminars & Presentations at Regional and National Conferences

Prior to 2006, presentations were given using my maiden name, Beildeck. In each case, presentations were given by the first author listed.

1. Carmen L. Huffman. Supramolecular chemistry: Unveiling the noncovalent bond. Invited seminar, University of Tennessee, Chatanooga, TN, February 11, 2011.

2. Carmen Huffman, D. M. Benoist, and Emily McCullough. *Binding affinities of crown-type macrocycles with protonated primary amines.* 240$^{\text{th}}$ National Meeting of the American Chemical Society (poster). Boston, MA, August 22-26, 2010.

3. Eva R. Garland, Elias P. Rosen, Laura I. Clarke, Carmen L. Huffman, Scott Huffman, Jason Bochinski, and Tomas Baer. *Structure and reactivity of organic coatings on inorganic aerosol particles.* 235$^{\text{th}}$ National Meeting of the American Chemical Society. New Orleans, LA, April 6-10, 2008.

4. Erin A. Hinson, Katie M. Blumsack, Kelly A. Lawrence, and Carmen L. Huffman. *Ions at the Air/water Interface: Inhibition or Enhancement of Neutral Solute Adsorption.* 59$^{\text{th}}$ Southeast Regional Meeting of the American Chemical Society (poster). Greenville, SC, October 24-27, 2007.

5. Kelly A. Lawrence and Carmen L. Huffman. *Ions at the air/water interface: Inhibition or enhancement of neutral solute adsorption?* 233$^{\text{rd}}$ National Meeting of the American Chemical Society (poster). Chicago, IL, March 25-29, 2007.

6. Michael R. Brindza, Carmen L. Beildeck, and Robert A. Walker. *Strategies for developing hydrogen-bonding Molecular Rulers.* 230th National Meeting of the American Chemical Society. Washington, DC, Aug. 28-Sept. 1, 2005.

7. Robert A. Walker, Carmen Huffman, Milton Liu, and Daniel Burden. *The Influence of Surface Charge on Interfacial Polarity: Does It Matter?* 37th Middle Atlantic Regional Meeting of the American Chemical Society. New Brunswick, NJ, May 22-25, 2005.

8. Carmen L. Beildeck, William H. Steel, and Robert A. Walker. *Effects of surface charge and ionic strength on polarity at liquid surfaces.* 228th National Meeting of the American Chemical Society (*Sci-Mix* poster). Philadelphia, PA, August 22-26, 2004.

9. Robert A. Walker, Carmen L. Beildeck, and William H. Steel. *Solvent polarity across weakly and strongly associating liquid/liquid interfaces: Shape matters!* 228th National Meeting of the American Chemical Society. Philadelphia, PA, August 22-26, 2004.

10. Carmen L. Beildeck, William H. Steel, and Robert A. Walker. *Probing polarity at liquid/liquid interfaces with cationic molecular rulers.* 226th National Meeting of the American Chemical Society (*Sci-Mix* poster). New York, NY, September 7-11, 2003.

11. C. L. Beildeck, W. H. Steel, and R. A. Walker. *Investigation of polarity at liquid/liquid interfaces: Cationic molecular rulers.* Gordon Research Conference (poster). Lewiston, ME, July 2003.

12. Robert A. Walker, William H. Steel, and Carmen Beildeck. *Solvent polarity across liquid/liquid interfaces.* 225th National Meeting of the American Chemical Society. New Orleans, LA, March 23-27, 2003.

13. Carmen Beildeck, Brett L. Lucht, and William B. Euler. Comparison of analytical methods for characterization of the thermochromic transition of poly(3-alkylthiophene)s. *Polymer Preprints (American Chemical Society, Division of Polymer Chemistry)*, 42(2):211–212, 2001.

Other Noteworthy Activities & Affiliations

2009 - 2010	Search Committee, co-Chair, biochemistry position Department of Chemistry and Physics, Western Carolina University
2009 - 2010	Search Committee, co-Chair, open position Department of Chemistry and Physics, Western Carolina University
2007 - 2010	Dean's Advisory Council, member (elected position) College of Arts and Sciences, Western Carolina University
2007	Search Committee, member, secondary science education coordinator position College of Arts and Sciences, Western Carolina University
2006 - present	Chemistry Club, faculty advisor Department of Chemistry and Physics, Western Carolina University

2006 - present	Secondary Science Education Advisory Council, member College of Arts and Sciences, Western Carolina University
2006 - 2008	Recruitment Committee, chair Department of Chemistry and Physics, Western Carolina University
2006	Search Committee, member, biotechnology position Department of Chemistry and Physics, Western Carolina University
2005 - 2008 & 2008 - present	Curriculum Committee, member Department of Chemistry and Physics, Western Carolina University
2005 - 2010	Teacher Education Committee, member College of Arts and Sciences, Western Carolina University
2004 - 2005	Recruitment Committee, graduate representative Department of Chemistry and Biochemistry, University of Maryland
2003	Academic Careers in Chemistry Workshop, attendant Eastern Analytical Symposium, NJ
2003	Research Experiences for Undergraduates, mentor National Science Foundation, Materials Research Science and Engineering Center
2001 - present	American Chemical Society, member Divisions: Chemical Education, Physical Chemistry
2000 - 2001	Student Affiliates of the American Chemical Society, president University of Rhode Island Chapter

Scott W. Huffman

Department of Chemistry and Physics 828-227-3669 (Work)
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Cullowhee, NC 28723 shuffman@email.wcu.edu

Education

- 2001, Ph.D. in Analytical Chemistry, University of Rhode Island, Kingston, RI
  Professor Chris W. Brown, Adviser
- 1997, M.S. in Chemistry, University of North Carolina at Wilmington, Wilmington, NC
  Professor John J. Manock, Adviser
- 1994, B.S. in Chemistry, University of North Carolina at Wilmington, Wilmington, NC

Research Interests

- Vibrational Spectroscopy
- Instrumentation development
- Chemometrics

Teaching Experience

- 2011-Present, Associate Professor of Chemistry at Western Carolina University
- 2005-2010, Assistant Professor of Chemistry at Western Carolina University
- 2004-2005, Supervising an undergraduate student
- 2000, Teaching Assistant for Inorganic Chemistry Laboratory at the University of Rhode Island
- 1998-2001, Supervising two undergraduate students
- 1998-2000, Teaching Assistant for Physical Chemistry Laboratory at the University of Rhode Island
- 1997-1999, Teaching Assistant for General Chemistry Laboratory at the University of Rhode Island
- 1995-1997, Teaching Assistant for Physical Chemistry Laboratory at the University of North Carolina at Wilmington
- 1995-1997, Teaching Assistant for Inorganic Chemistry Laboratory at the University of North Carolina at Wilmington

Employment

- 2011-Present, Associate Professor
  Department of Chemistry and Physics
  Western Carolina University
  Cullowhee, NC
- 2005-2010, Assistant Professor
  Department of Chemistry and Physics
  Western Carolina University
  Cullowhee, NC
- 2001-2005, Research Fellow
  Laboratory of Chemical Physics
  National Institute of Diabetes and Digestive and Kidney Diseases
  National Institutes of Health
  Bethesda, MD
  Ira W. Levin, Ph. D., Supervisor
- 2000, Summer Internship/Application Chemist at Bio-Rad Laboratories, Digilab Division
  Cambridge, MA
- 1998-2001, Vibrational Spectroscopy Specialist
  Rhode Island Crime Lab
  Kingston, RI

Honors and Awards

- 2003, Society of Applied Spectroscopy's Meggers Award
- 2002, NIH Loan Repayment Award
- 2000, Ken Force Memorial Scholarship
- 2000-2001, University of Rhode Island Graduate Fellowship
- 2000, Department of Chemistry of the University of Rhode Island
  Graduate Teaching Assistant Award
- 1999, Amos Kroencke Memorial Scholarship
- 1996, Lewis Nance Memorial Scholarship
- 1986, Eagle Scout

Publications in Refereed Journals

1. Nicole J. Crane, **Scott W. Huffman**, Peter A. Pinto, Ira W. Levin, Eric A. Elster; "Evidence of a Heterogeneous Tissue Oxygenation: Renal Ischemia/Reperfusion Injury in a Large Animal Model," *The American Journal of Physiology - Renal Physiology submitted* (2011).

2. **Scott W. Huffman**, Arthor Salido, and David Evanoff; "Quantitative Infrared Spectroscopy in the Undergraduate Laboratory via Multivariate Mixture Analysis of a Simulated Analgesic," *Spectroscopy Letters* **43**, 539-544, 2010.

3. Ned H. Martin, Ruth M. Floyd, H. Lee Woodcock, **Scott Huffman**, Chang-Kiu Lee; "Computation of through-space NMR shielding effects in aromatic ring π-stacked complexes," *Journal of Molecular Graphics and Modeling* **26**, 1125-1130, (2008).

4. Nicole J. Crane, Edward G. Bartick, Rebecca Schwartz Perlman, **Scott W. Huffman**; "Infrared Spectroscopic Imaging for Non-Invasive Detection of Latent Fingerprints," *Journal of Forensic Sciences* **52**, 48-53, (2007).

5. Donsheng Bu, **Scott W. Huffman**, John Seelenbinder and Chris W. Brown; "Enhancement of Infrared Hyperspectral Images for Maximizing Chemical Information; Minimizing Baseline Interference," *Applied Spectroscopy* **59**, 575-583 (2005).

6. **Scott W. Huffman**, Sebastian Schlücker and Ira W. Levin; "Reorganizational Dynamics of Multilamellar Lipid Bilayer Assemblies Using Continuously Scanning Fourier Transform Infrared Spectroscopic Imaging," *Chemistry and Physics of Lipids* **130**, 167-174, (2004).

7. Sebastian Schlücker, Michael D. Schaeberle, **Scott W. Huffman** and Ira W. Levin; "Raman Microspectroscopy: A Comparison of Point, Line and Wide-Field Imaging Methodologies," *Analytical Chemistry*, **75**, 4312-4318, (2003).

8. **Scott W. Huffman**, Susan Geldart, Susan Elliot, Jay F. Sperry and Chris W. Brown; "Analysis of Microbial Components Using LC-IR," *Analytical Chemistry*, **75**, 4606-4611, (2003).

9. **Scott W. Huffman**, Rohit Bhargava and Ira W. Levin; "A Generalized Implementation of Rapid-Scan Fourier Transform Infrared Spectroscopic Imaging," *Applied Spectroscopy*, **56**, 965-969, (2002).

10. Krista B. von Arx, John J. Manock, **Scott W. Huffman**, Michael Messina; "Using Limited Concentration Data for the Determination of Rate Constants with the Genetic Algorithm," *Environmental Science and Technology*, **20**, 3207-3212, (1998).

Other Publications

1. Nicole J. Crane, Neil S. Kansal, Nadeem Dhanani, Mehrdad Alemozaffar, Allan D. Kirk, Peter A. Pinto, Eric A. Elster, **Scott W. Huffman**, Ira W. Levin; "Visual enhancement of laparoscopic nephrectomies using the 3-CCD camera"; Photonics West, 2006.

2. **Scott W. Huffman** and Chris W. Brown; "Multivariate Analysis of Infrared Spectroscopic Imaging Data," Chapter in Book *Spectrochemical Analyses Using Infrared Multichannel Detectors*, Blackwell Publishing, 2005.

3. Sebastian Schlücker, **Scott W. Huffman**, and Ira W. Levin; "Vibrational Microspectroscopic Imaging: Spatial Resolution Enhancement"; Photonics West:BIOS 2004.

4. **Scott W. Huffman**, Kara B. Lukasiewicz and Chris W. Brown; "FTIR Hyperspectral Images of Microscopic Droplets of Splattered Blood," *Microscopy Today*, May 2003.

Grants Received

1. National Science Foundation Major Research Instrumentation grant entitled "MRI: Acquisition of a Raman Microscope for Undergraduate Research and Education" with David Evanoff. 2010.

2. TERAGRID allocation Grant entitled "Calculation of the Intrisic Reaction Coordinate of Butadiene derivatives in Solid State Reactions" with Brian Dinkelmeyer. Actual funding is in kind 20,000 hours allocation from TERAGRID supercomputing centers. 2008.

3. NCUR/Lancy Foundation Award (WCU Internal Awardee)

4. Institute for Economy and the Future Seed Grant for the proposal entitled "A Survey of Coloring Practices by Indigenous People of Western North Carolina" (WCU Internal)

5. Ocean Optics Educational Grant entitled "Reaction Monitoring in an Organic and Inorganic Synthesis Undergraduate Laboratory with Raman Spectroscopy"

Meeting Abstracts

1. **Scott W. Huffman** and Caitlin G. Williams; "Archaeometry and Other Cultural Heritage Object Characterizations with Hand-Held Spectroscopy"; Eastern Analytical Symposium 2010.[1]

2. **Scott W. Huffman**, Caitlin Williams, Nicole J. Crane, Ira W. Levin and Eric A. Elster; "The Development of Infrared Spectroscopic Imaging-based Histochemical Methods for the Prediction of Kidney Ischemia"; The Federation of Analytical Chemistry and Spectroscopy Socieities Conference 2010.

3. **Scott W. Huffman** Jessica Spear, and Renske Leenders; "Authentication of Cremation Remains with Infrared Spectroscopy and Chemometrics." The Pittsburgh Conference 2010.

4. Jessica Spear and **Scott W. Huffman**; "Authentication of Cremation Remains with Infrared Spectroscopy"; National Council on Undergraduate Research Conference 2009.

5. Tyler Jones William R. Kwochka, and **Scott W. Huffman**; "Surface Attachment and Characterization of Boroxines on Glass"; South Eastern Regional Meeting of the American Chemical Society 2008.

[1]Invited Presenter

6. Tyler Jones and **Scott W. Huffman**; “Self Assembled Monolayers as Foundations for Chemical Sensors”; Science in the Mountains 2008.

7. **Scott W. Huffman**, Erika Sesti, Laura Cleveland, Kyle D. Beard, and Brian Dinkelmeyer; “Using Spectroscopy and Chemometrics to Extract Chemical Information about Mixtures”; The Pittsburgh Conference 2008.

8. Erika Sesti and **Scott W. Huffman**; “Nondestructive Measurements of Museum Artifacts”; South Eastern Regional Meeting of the American Chemical Society 2007.

9. **Scott W. Huffman**, Erika Sesti, and Laura Cleveland; “Mixture Analysis with Spectroscopy and Chemometrics”; South Eastern Regional Meeting of the American Chemical Society 2007.

10. Amy Cagle and **Scott W. Huffman**; “Authenticity Determination: Spectroscopic Analysis of Traditional Cherokee and Modern Synthetic Dyes”; National Conference for Undergraduate Research 2007.

11. **Scott W. Huffman** and Suzanne McDowell; “We are Dying to Know, Where Did You Get Those Colors?”; North Carolina Museums Council Annual Meeting 2007.

12. **Scott W. Huffman**; “Mixture analysis of textiles with vibrational spectroscopy and chemometrics”; South Eastern Regional Meeting of the American Chemical Society 2006.

13. **Scott W. Huffman**; “Questionable Document Analysis with Fourier Transform Infrared Spectroscopic Imaging”; The Pittsburg Conference 2006.

14. Ira W. Levin, Quan Li, Frank Howard, **Scott W. Huffma**n; “Biomembrane Structural Determinations using Infrared Spectroscopy and Ultra-Sound: Effects of Lipid Microdomains on Integral Membrane Protein Reorganizations”; *Abstracts of Papers of the American Chemical Society* 228; ANYL 41 2005.

15. Ira W. Levin, Rohit Bhargava, Nicole J. Crane, Stephen W. Hewitt, **Scott Huffman**; “Applications of Vibrational and Visible Reflectance Spectroscopic Imaging: Tissue Pathology and Tissue Perfusion”; The Pittsburgh Conference 2006.

16. **Scott W. Huffman** and Ira W. Levin; “Reorganizational Dynamics of Multilamellar Lipid Bilayer Assemblies using High-Pressure Fourier Transform Infrared Spectroscopy”; *Abstracts of Papers of the American Chemical Society* 226; AEI 2004.

17. Ira W. Levin, **Scott W. Huffman**, Sebastian Schlücker, Daniel C. Fernandez and Rohit Bhargava; “Vibrational Spectroscopic Imaging: From Macromolecular Assemblies to Biological Tissue”; *Abstracts of Papers of the American Chemical Society* 226; ANYL Part 2 2004.

18. Ira W. Levin, **Scott W. Huffman**, Quan Li, Sebastian Schlücker, and Rohit Bhargava; “Biomolecular Heterogeneity at the Membrane and Tissue Level Extremes: Vibrational Spectroscopy Using Single-Element and Imaging Detection”; The Pittsburg Conference 2004.

19. Ira W. Levin, Daniel C. Fernandez, **Scott W. Huffman**, Sebastian Schlücker, Karel J. Zuzak, and Rohit Bhargava; “Biomedical Imaging: Vibrational and Visible Reflectance Spectroscopic Imaging of Biological Tissue”; The Pittsburg Conference 2004.

20. Ira W. Levin, **Scott W. Huffman**, Sebastian Schlücker, Daniel C. Fernandez, Stephen M. Hewitt, and Rohit Bhargava; "Vibrational Spectroscopic Imaging: Prostate and Esophageal Histopathology"; The Pittsburg Conference 2004.

21. **Scott W. Huffman**, Quan Li, Sebastian Schlücker and Ira W. Levin; "Reorganizational Dynamics Monitoring Using Continuously Scanning Fourier Transform Infrared Spectroscopic Imaging of Model Membrane Multilamellar Lipid Bilayer Assemblies"; The Biophysical Society Meeting 2004.

22. Quan Li, **Scott W. Huffman**, and Ira W. Levin; "Effects of Lipid Microdomain Formation on Membrane Protein Reorganizations in Model Membrane Assemblies: Infrared Spectroscopic Studies of Bacteriorhodopsin in Aqueous Binary Phosphatidylcholine Dispersions"; Biophysical Society Meeting 2004.

23. Sebastian Schlücker, **Scott W. Huffman**, and Ira W. Levin; "Raman Microscopy and Imaging: Biomedical Applications"; Raman and IR Spectroscopy in Biology and Medicine 2004.

24. Ira W. Levin, **Scott W. Huffman**, Rohit Bhargava, Daniel C. Fernandez and Karel J. Zuzak; "Biomedical Applications of Infrared and Visible Reflectance Spectroscopic Imaging: From Bench to Bedside"; Federation of Analytical Chemistry and Spectroscopy Societies Conference 2003.

25. Ira W. Levin, Daniel C. Fernandez, **Scott W. Huffman**, Karel J. Zuzak and Rohit Bhargava; "Approaches to infrared and visible reflectance spectroscopic imaging"; *Abstracts of Papers of the American Chemical Society* 226; 64-PHYS Part 2 2003.

26. Rohit Bhargava, Daniel C. Fernandez, **Scott W. Huffman**, Steven M. Hewitt, and Ira W. Levin; "Infrared Spectroscopic Imaging for Biomedical Diagnostics"; The Pittsburgh Conference 2003.

27. Chris W. Brown, John A. Seelenbinder, **Scott W. Huffman**, and Dongsheng Bu; "Enhancement of Infrared Spectral Images for Maximizing Chemical Information"; The Pittsburgh Conference 2003.

28. **Scott W. Huffman**, Rohit Bhargava, Sebastian Schlücker and Ira W. Levin; "High Fidelity Spectroscopic Imaging of Dynamic Processes"; The Pittsburgh Conference 2003.[2]

29. Ira W. Levin, Daniel C. Fernandez, Michael D. Schaeberle, **Scott W. Huffman**, Karel J. Zuzak and Rohit Bhargava; "Approaches to Infrared and Visible Reflectance Spectroscopic Imaging"; First Colloquium in Protein Structure, Function and Dynamics, 2003.

30. Chris W. Brown, **Scott W. Huffman**, Kara Lukasiewicz and Edita Botonjic; "The Bounce in Major League Baseballs: FTIR Tells the Story!"; Federation of Analytical Chemistry and Spectroscopy Societies Conference 2002.

31. Chris W. Brown and **Scott W. Huffman**; "Reducing Pixel-to-Pixel Variations in Backgrounds of Infrared Spectral Imagines"; Federation of Analytical Chemistry and Spectroscopy Societies Conference 2002.

[2]Invited Presenter

32. **Scott W. Huffman**, Rohit Bhargava and Ira W. Levin; "Using Rapid-Scan Fourier Transform Infrared Spectral Imaging for Monitoring Dynamic Processes"; Federation of Analytical Chemistry and Spectroscopy Societies Conference 2002.

33. Ira W. Levin, Daniel C. Fernandez, Michael D. Schaeberle, **Scott W. Huffman**, Karel J. Zuzak and Rohit Bhargava; "Approaches to Infrared and Visible Reflectance Spectroscopic Imaging"; Federation of Analytical Chemistry and Spectroscopy Societies Conference 2002.

34. Rohit Bhargava, Daniel C. Fernandez, **Scott W. Huffman**, Michael D. Schaeberle and Ira W. Levin; "Fourier Transform Infrared Spectroscopic Imaging Methods for Biomedical Diagnostics"; Federation of Analytical Chemistry and Spectroscopy Societies Conference 2002.

35. Chris W. Brown, **Scott W. Huffman**, Edita Bontonjic, and Marc Lamontagne; "Spectra and Multi-Spectral Images of Aging Bloodstains"; The Pittsburgh Conference 2002.

36. Rohit Bhargava, Daniel C. Fernandez, Michael D. Schaelberle, **Scott W. Huffman**, and Ira W. Levin; "FT-IR Imaging of Biological Tissue for Histopathological Analysis"; The Pittsburgh Conference 2002.

37. Ira W. Levin, Daniel C. Fernandez, Michael D. Schaeberle, **Scott W. Huffman**, Karel J. Zuzak and Rohit Bhargava; "Approaches to Vibrational and Visible Spectroscopic Imaging of Biological Tissue"; Biomaterials Conference 2002.

38. **Scott W. Huffman**, Chris W. Brown, and Ira W. Levin; "Chemical and Biological Spectral Imaging"; Eastern Analytical Symposium 2001.[3]

39. Chris W. Brown and **Scott W. Huffman**; "Applications of Fast Fourier Transform to Spectral Processing"; Eastern Analytical Symposium 2001.

40. Chris W. Brown, **Scott W. Huffman**, Kara Lukasiewicz; "Infrared Spectral Images of Food-Borne Pathogens"; The Pittsburgh Conference 2001.

41. **Scott W. Huffman**, Kara Lukasiewicz, Susan E. Geldart, Chris W. Brown; "Deciphering Amino Acid Sequences of Polypeptides with FTIR"; The Pittsburgh Conference 2001.

42. Kara Lukasiewicz, **Scott W. Huffman**, Susan E. Geldart, Chris W. Brown; "Analysis of Microbial Components Using LC-IR"; The Pittsburgh Conference 2001.

43. Chris W. Brown, Kara Lukasiewicz, **Scott W. Huffman**, Dongsheng Bu; "Infrared and Chemical Images of Microbes"; Eastern Analytical Symposium 2000.

44. Kara Lukasiewicz, **Scott W. Huffman**, Chris W. Brown; "Mid and Near-Infrared Detection of Pathogens"; Eastern Analytical Symposium 2000.

45. **Scott W. Huffman**, Kara Lukasiewicz, Chris W. Brown; "SEIRA of Biologically Relevant Molecules"; Eastern Analytical Symposium 2000.

[3] Invited Presenter

46. Chris W. Brown, **Scott W. Huffman**, Tim Wasco; "Raman Spectra Measured with a Digital Micromirror Array"; Eastern Analytical Symposium 2000.
47. Luciana Coutinho, **Scott W. Huffman**, Chris W. Brown, Louis J. Kirschenbaum; "Assessment of Structural Changes in Human Hair by Near IR Microscopy"; *Abstracts of Papers of the American Chemical Society* 219 ANAL 2000.
48. Luciana Coutinho, Chris W. Brown, **Scott W. Huffman**, Louis J. Kirschenbaum; "Near Infrared Microscopy of Human Hair"; The Pittsburgh Conference 2000.
49. **Scott W. Huffman**, Kara Lukasiewicz, Chris W. Brown, Susan E. Geldart; "Cellular Composition Elucidation with LC-IR"; The Pittsburgh Conference 2000.
50. Kara Lukasiewicz, **Scott W. Huffman**, Chris W. Brown, Phil Pivarnik, and Arthur G. Rand; "Mid- and Near-Infrared Spectra of Pathogens"; The Pittsburgh Conference 2000.
51. Chris W. Brown, **Scott W. Huffman**, and Timothy S. Wasco; "Hyper-Spectral Images with a Digital Micro-Mirror Array"; The Pittsburgh Conference 2000.
52. Chris W. Brown, Kara Lukasiewicz, **Scott W. Huffman**, Phil Pivarnik, and Arthur G. Rand; "Infrared Spectroscopic Detection of Pathogens"; Eastern Analytical Symposium 1999.
53. Chris W. Brown and **Scott W. Huffman**; "Spectral Images Using a Hadamard Encoded Near-Infrared Spectrometer"; Eastern Analytical Symposium 1999.
54. Chris W. Brown, Dongsheng Bu, **Scott W. Huffman**, Nancy P. Comancho, and Richard Mendelsohn; "Data Compression and Spectral Deconvolution of IR Images"; The Pittsburgh Conference 1999.
55. **Scott W. Huffman**, Jeffrey W. Harwood, John A. Seelenbinder, Dongsheng Bu, Chris W. Brown; "A Dual Detector Hadamard Transform Imaging Spectrometer"; The Pittsburgh Conference 1999.
56. **Scott W. Huffman**, John Seelenbinder, James M. Treubig Jr., Chris W. Brown, Eugene A. Cioffi, Phyllis Brown, and Daniel W. Urish; "Real-Time Ultraviolet Spectroscopic Analyzer for Detection and Monitoring of Anthropogenic and Background Nitrate"; Eastern Analytical Symposium, 1998.

William R. Kwochka **Curriculum *vitae***

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Western Carolina University
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Fax: 828.227.7393
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Education

Ph.D., Organic Chemistry, North Carolina State University, Raleigh, NC, 1992
Adviser: Professor Russell J. Linderman

Graduate Study, Organic Chemistry, Duke University, Durham, NC, 1987
Adviser: Professor Ned Porter

B.A., Chemistry, Grinnell College, Grinnell, IA, 1983
Adviser: Professor James E. Swartz

Summer Undergraduate Research Assistant, Iowa State University, Ames, IA, 1982
Adviser: Professor Rodney R. Walters

Experience

2010 - Present — *Associate Department Head* in the Department of Chemistry & Physics at Western Carolina University, Cullowhee, NC

Summer 2006 — *Visiting Associate Professor of Chemistry* at the University of North Carolina at Asheville, Asheville, NC
Research focus: preparation of amide-based rotaxanes.

Aug 2003 - July 2004 — *Visiting Researcher* in the School of Chemistry at the University of Edinburgh, Scotland, UK
Research focus: preparation and study of rotaxanes.

2000 - Present — *Associate Professor of Chemistry* at Western Carolina University, Cullowhee, NC

- Taught 12 to 15 contact hours/semester; Courses include: survey of organic and biochemistry, general chemistry, general chemistry lab, organic I and II, organic lab, advanced synthesis lab, and advanced organic.
- **Research focus**: preparation of macrocycles for incorporation into supramolecular systems.
- External awards of $81,000 for research and $290,000 for instrumentation.
- Finalist for the College of Arts and Sciences teaching award in 2000.
- Served and chaired on several department, college, and university committees.
- Cryogen and system maintenance of 300 MHz JEOL NMR.
- Department head for summer 2001.
- Assessment coordinator for the chemistry department.
- Graduate program coordinator (15 students) for the chemistry department.

Summer 1998 — *Visiting Assistant Professor of Chemistry* at Virginia Tech, Blacksburg, VA
Research focus: preparation of diyne macrocycles using metal-mediated couplings.

1994 - 2000 — *Assistant Professor of Chemistry* at Western Carolina University, Cullowhee, NC

1992 - 1994 — *Camille and Henry Dreyfus Postdoctoral Teaching Fellow* at the University of Colorado at Denver, Denver, CO

- Coordinated teaching experiment for 15 chemistry majors.
- **Research focus**: preparation of silicon-containing cage compounds.

1987 - 1992 — *Graduate Student* in the Department of Chemistry, North Carolina State University, Raleigh, NC
Research focus: preparation of Furanones using organostannanes; natural product synthesis.

1986 - 1987 — *Graduate Student* in the Department of Chemistry, Duke University, Durham, NC

1985 - 1986 *Research Technician* in the Department of Microbiology, Duke University, Durham, NC

1983 - 1985 *Research Assistant* at Petroferm Research, Inc., a biotechnology firm in Cambridge, MA

Funding

- Savannah River National Lab **contract** entitled "Organo-boron Based Self Assembly Chemistries: Toward Improved Material Design and Charge Injection". Co-PI with Dr. Lucile Teague, **2010**, $37,643.
- Savannah River National Lab **contract** entitled "Organo-boron Based Self Assembly Chemistries: Toward Improved Material Design and Charge Injection". Co-PI with Dr. Lucile Teague, **2009**, $37,643.
- National Science Foundation *Research Site for Educators in Chemistry* (*RSEC*) grant, "Impossible Rotaxanes via a Mechanically Interlocking Auxiliary," P.I., **summer 2006**, for summer research fellowship sabbatical at the University of North Carolina at Asheville, $13,500.
- Western Carolina University *School University Teacher Education Partnership* (*SUTEP*), P.I., **spring 2007**, for work with Evergreen Community Charter School in Asheville, $1,200. Funding was used to purchase supplies for the science program at Evergreen CCS.
- Western Carolina University Graduate School for a Faculty Research Grant, "Rotaxanes via a Mechanically Interlocking Auxiliary: Making the Impossible, Possible," P.I., **2004-2005**, $7000.
- ACS-PRF **U**ndergraduate **F**aculty **S**abbatical grant, "Mechanized Molecules: Rotaxanes and Catenanes as Building Blocks for Molecular Architectures," P.I., **2003-2004**, $37,139 with matching funds from Western Carolina University for a year long sabbatical at the University of Edinburgh, Scotland, UK.
- NSF-**R**esearch **O**pportunity **A**ward to conduct summer research at Virginia Tech, co-P.I., **summer 1998**, $14,187.
- ACS-PRF Type G starter grant, "Designing Macrocycles for Supramolecular Assembly," P.I., **1998-2000**, $20,000.
- NSF-ILI grant for a NMR, "Using FT-NMR in an Environmental Curriculum," co-P.I., **1998-2000**, $186,067.
- NSF-ILI grant for a GC/MS, "Implementation of an Environmental Focus in an Undergraduate Chemistry Curriculum by the Addition of Gas Chromatography-Mass spectrometry," co-P.I., **1998-2000**, $90,114.
- North Carolina Supercomputing Center grant for an SGI-O2 workstation and access to the Cray supercomputer, "Visualization of Chemistry through Molecular Modeling," P.I., **1997-2000**, $9,500.
- Western Carolina University Honors College for an Undergraduate Research Support Award, "Synthesis of a 20-Membered Cyclophane," P.I., **1997**, $427.
- Western Carolina University Graduate School for a Faculty Research Grant, "Formation of 3-(2H) Tetrahydrofuranones and 3-Pyrrolidinones via Palladium Catalyzed Ring Expansions of Vinyl Epoxides," P.I., **1995-1996**, $2,500.
- Camille and Henry Dreyfus Foundation starter grant for Dreyfus Fellows, "Synthesis of Tetrahydrofuranones and Pyrrolidinones via Palladium Catalysis," P.I., **1994-1996**, $10,000.

Publications and Presentations

Beverly B. Smith*, Darron E. Hill*, T. Ashton Cropp*, Rosa D. Walsh, David Cartrette, Sherry Hipps*, Amy M. Shachter, William T. Pennington, and William R. Kwochka, "Synthesis of [*n*]- and [*n.n*]Cyclophanes Using the Suzuki-Miyaura Coupling", *J. Org. Chem*., **2002**, 67, 5333-5337.

Cynthia Atterholt, David Butcher, J. Roger Bacon, William R. Kwochka, Royce Woosley, "Implementation of an Environmental Focus in an Undergraduate Chemistry Curriculum by the Addition of Gas Chromatography-Mass Spectrometry" *J. Chem. Ed*., **December 2000**, *77*(12), 1549-1550.

Beverly B. Smith*, William R. Kwochka, Robert Damrauer, R. Jeffrey Swope, Joseph R. Smyth, "Synthesis of [6.6]Metacyclophane via the Suzuki Coupling," *J. Org. Chem*., **1997**, *62*, 8589-8590.

William R. Kwochka "*New Faculty Concerns*: What I Wish I Knew Before I Took THE PLUNGE," *Council on Undergraduate Research Quarterly,* **December 1995**, *16 (2)*, 117-119.

William R. Kwochka, Robert Damrauer, Michael W. Schmidt, and Mark S. Gordon, "Synthetic and Computational Studies of Silametacyclophanes: Macrocyclic Cage Compounds," *Organometallics* **1994**, *13*, 3728-3735.

Russell J. Linderman, Kevin P. Cusack, and William R. Kwochka, "Selective Deoxygenation of β, β'-Dioxygenated 3-(2H)-Furanones," *Tetrahedron Lett.* **1994,** *35*, 1477-1480.

Russell J. Linderman, Fabrice G. Viviani, and William R. Kwochka, "Novel Methods for the Construction of 3-(2H)-Furanone Spiroketals," *Tetrahedron Lett.* **1992,** *33*, 3571-3574.

Russell J. Linderman, David M. Graves, William R. Kwochka, Ameen F. Ghannam and T. V. Anklekar, "Furanone Synthesis via an Electrophilic Capped Carbonyl Ylide," *J. Am. Chem. Soc.* **1990**, *112,* 7438-7439 (communication).

Presentations

*Stephanie Lee Harper** and William R. Kwochka, "Formation of Dative Bonds Using Boronic Acid Derivatives and Lewis Bases" The Southeastern Regional Meeting of the American Chemical Society, Nashville, TN, USA, November 15, **2008**.

*Stephanie Lee Harper** and William R. Kwochka, "Design and Synthesis of a Molecular Box" Science in the Mountains, Cullowhee, NC, USA, July 11, **2008**.

*Yang V. Vue** and William R. Kwochka, "Synthesis of a Molecular Rotor" Science in the Mountains, Cullowhee, NC, USA, July 11, **2008**.

William R. Kwochka, *Rajendra Uprety*, and *Januka Budhathoki-Uprety*, "Synthesis of an Impossible Rotaxane via a Mechanically Interlocking Auxiliary" The Southeastern Regional Meeting of the American Chemical Society, Greenville, SC, USA, October 25, **2007** (Poster).

Rajendra Uprety, Januka Budhathoki, *William R. Kwochka*, Jeffery S. Hannam, and David A. Leigh, "Synthesis of an Impossible Rotaxane via a Mechanically Interlocking Auxiliary" The Gordon Research Conference on the Chemistry of Supramolecules & Assemblies, Tuscany, Italy, May 6-11, **2007** (Poster).

Lucile C. Teague, Erin Hinson, William R. Kwochka, and James G. Kushmerick, "Self-Assembled Monolayers of Alkyl-Tethered Π Moieties" The 223rd National Meeting of the American Chemical Society, Chicago, IL, USA, March 25-29, **2007** (Poster)

William R. Kwochka, Jeffery S. Hannam, and David A. Leigh, "Synthesis of an Impossible Rotaxane via a Mechanically Interlocking Auxiliary" **The Southeastern Regional Meeting of the American Chemical Society**, Augusta, GA, USA, November 1-4, **2006**.

William R. Kwochka, ""Impossible" Rotaxanes via a Mechanically Interlocking Auxiliary", Research Site for Educators in Chemistry Symposium (RSEC), University of Tennessee at Knoxville, August 13-15, **2006**.

*Tiffany M. Mingin**, *Christian P. Jensen**, Mark Clark, and William R. Kwochka, "Rotaxanes as Precursors for a Molecular Muscle" The 20th National Conference on Undergraduate Research, University of North Carolina at Asheville, Asheville, NC, April 6-8, **2006** (poster).

*Tiffany M. Mingin**, *Christian P. Jensen**, and William R. Kwochka, "Rotaxanes as Precursors for a Molecular Muscle" The 4th Annual State of North Carolina Undergraduate Research Symposium, North Carolina State University, Raleigh, NC, November 11-12, **2005**.

David A. Leigh, *Jeffrey S. Hannam*, and William R. Kwochka**,** "Rotaxane-In-A-Bottle: The Synthesis Of Novel [2]Rotaxanes Using A Mechanically Interlocking Auxiliary" The 229th ACS National Meeting, San Diego, CA, USA, March 13-17, **2004**.

Jeffrey S. Hannam, *William R. Kwochka*, and David A. Leigh, "Mechanically Interlocking Auxiliaries: Rotaxane-In-A-Bottle" **The XIIIth International Symposium on Supramolecular Chemistry**, University of Notre Dame, IN, USA, July 25-30, 2004.

Beverly B. Smith*, Darron E. Hill*, T. Ashton Cropp*, Rosa D. Walsh, David Cartrette, Sherry Hipps*, Amy M. Shachter, William T. Pennington, and *William R. Kwochka* "Synthesis of [*n*]- and [*n.n*]Cyclophanes Using the Suzuki-Miyaura Coupling" 54th Annual Southeastern Regional Meeting of the American Chemical Society in Charleston, SC, November 14, **2002**.

*Crystal L. Olson**, Jon Collins, Sharon Boggs, and William R. Kwochka "The Combinatorial Synthesis of 8-Amino Purines" Council on Undergraduate Research Annual Posters-on-the-Hill, Washington, DC, April 18, **2002**.

William R. Kwochka "Formation of Macrocycles Using Metal-Mediated Reactions" 50th Annual Southeastern Regional Meeting of the American Chemical Society in the Research Triangle Park, NC, November 7, **1998**.

*Jessica DelBove** and William R. Kwochka, "Heteroatom-Containing Cyclophanes via the Suzuki Coupling." 30th Annual Southeastern Regional American Chemical Society Student Affiliate Undergraduate Research Conference at Kennesaw State University in Kennesaw, GA, March 20, **1998**.

Beverly B. Smith*, Ashton Cropp*, David Cartrette*, Greg Hall*, Elizabeth Klemmer*, Sherry Hipps*, and *William R. Kwochka*, "Preparation of Cyclophanes via a Palladium Catalyzed Coupling Reaction." American Chemical Society 213th National Meeting, San Francisco, CA, April 13 -17, **1997** (abstract # 421).

*Beverly B. Smith** and William R. Kwochka, "Metacyclophanes via a Palladium Catalyzed Coupling Reaction." The 10th National Conference on Undergraduate Research, University of North Carolina at Asheville, Asheville, NC, April 18 -20, **1996**.

Robert Damrauer and *William R. Kwochka*, "Synthesis of Silicon-Containing Cyclophanes via the Suzuki Coupling." ACS 207th National Meeting, San Diego, CA, March 13 - 18, **1994**.

William R. Kwochka, "A Dreyfus Fellow's View of the Research Aspect of the Training Program." ACS 207th National Meeting, San Diego, CA, March 13 - 18, **1994** (panel discussion).

William R. Kwochka, David Crocker*, Michael Leavell*, David McEwen*, Fedri J. Marrugo*, Zahra Nadji*, Lori K. Sanders*, Melissa Tallant*, and Trang Y. Vo*, "The Integrated Laboratory Research Program." ACS 205th National Meeting, Denver, CO, March 28 - April 2, **1993** (poster).

* Denotes student co-author, *italics* denotes presenter

In addition, I have given invited presentations at the University of Georgia, the University of North Carolina at Asheville, Appalachian State University, the University of Edinburgh, Virginia Tech, Warren Wilson College, Davidson College, the University of South Carolina – Columbia, the University of South Carolina – Upstate, and Savannah River National Lab.

Professional Associations

- American Chemical Society, *member* of Organic Division, 1987 - present.
- Phi Lambda Upsilon (chemistry honors society), *member* 1989 - present.
- Council on Undergraduate Research, *member* 1992 – present; *chemistry councilor* 2003 - 2006.

References

Dr. Paul F. Brandt	Dr. David J. Butcher	Dr. Cynthia A. Atterholt	Dr. Lucile C. Teague
Department of Chemistry	Department of Chemistry	Department of Chemistry	
North Central College	*Western Carolina University*	*Western Carolina University*	*Savannah River National Lab*
30 North Brainard Street Naperville, IL 60566	Cullowhee, NC 28723	Cullowhee, NC 28723	Aiken, SC 20742-4454
630.637.5193 *e-mail*: pabrandt@noctrl.edu	828.227.3683 *e-mail*: butcher@wcu.edu	828.227.3667 *e-mail*: catterholt@wcu.edu	803.514.0226 *e-mail:* Lucile.Teague@srnl.doe.gov

Charles F. Marth

HOME 347 Balsam Drive
Waynesville, NC 28786
(828) 456-7815
email: cfmarth@bellsouth.net

BUSINESS Dept. of Chemistry and Physics
Western Carolina University
Cullowhee, NC 28723
(828) 227-3674

EDUCATION

Post-doctoral Research — September 1988 - August 1990
Philipps - Universität Marburg
Marburg, Germany

Ph. D., Organic Chemistry — August 1988
"Mechanistic and Synthetic Studies on the Wittig Reaction"
Prof. Edwin Vedejs, University of Wisconsin - Madison

B.S. Chemistry — May 1983
cum laude graduate
Graduation with distinction in Chemistry
Duke University, Durham, NC

WORK EXPERIENCE

Visiting Assistant Professor, **Western Carolina University**, May 2003 – present.
Taught lecture courses in general, organic, and advanced organic chemistry, plus a survey of organic and biochemistry. Taught organic chemistry laboratory and advanced synthesis lab. Also taught the freshman seminar entitled "Chemistry in Industry" and the advanced "Industrial Chemistry".

Senior Research Chemist, **Angus Chemical Company**, October 1996 – October 2002.
Synthesis of nitroalkane derivatives. Designed and performed multi-step syntheses of pharmaceutical intermediates from nitroalkanes. Planned new synthetic routes to known drug intermediates. Prepared new biological buffers in lab, developed and optimized synthetic processes for scale-up, and supported pilot plant and full-scale production of these compounds.

Senior Research Chemist, **Nalco Chemical Company**, September 1990 - September 1996.
Synthesis of new water-soluble monomers for treatment of wastewater. Developed and tested chemically-modified starches for use in nutrient recovery programs. Synthesized organo-phosphonates for scale control applications. Carried out laboratory synthesis of superabsorbent polymers and supported pilot plant and plant trials during product scale-up. Developed new pilot-scale polymerization equipment.

Post-doctoral Researcher, **Philipps - Universität Marburg**, September 1988 - August 1990.
Synthesis of organotitanium compounds and mechanistic studies of Ti-catalyzed aldol reactions of enol silanes using titanium and proton NMR. Carried out stereoselective syntheses using N-protected amino aldehydes derived from amino acids. Developed a new purification procedure for amino-aldehyde intermediates. (Prof. Manfred Reetz)

Research Assistant, **University of Wisconsin - Madison**, June 1984 - August 1988.
Mechanistic studies of the Wittig reaction. Conducted low-temperature observation of reaction intermediates using heteronuclear, proton, and 2-D NMR. Synthesized new Wittig reagents and other organophosphorus compounds. Worked with air- and temperature-sensitive reagents. Developed a new Wittig reagent for the selective synthesis of *trans* alkenes. (Prof. Edwin Vedejs)

Charles F. Marth

SPECIAL ABILITIES

Extensive experience with computers (Windows and Office application programs). Advanced Excel training. Experience with HTML and web page design.

Experienced in the maintenance and use of high-field NMR instruments.

Trained in the use of experimental design and computer-aided statistical analysis of data.

Proficiency in written and spoken German.

SELECTED PUBLICATIONS and PATENTS

D. W. Fong, Charles F. Marth, and Ronald Davis, "Sulfobetaine-Containing Polymers and Their Utility as Calcium Carbonate Scale Inhibitors", U.S. Patent 5,788,866, August 4, 1998.

E. Vedejs and C. F. Marth, "^{31}P NMR Detection and Analysis of Wittig Intermediates", in Phosphorus-31 NMR Spectral Properties, pp. 297-313. Publisher: VCH, New York, **1994**.

M. T. Reetz, B. Raguse, and C. Marth, "A Rapid-Injection NMR Study of the Chelation-Controlled Mukaiyama Aldol Addition", *Tetrahedron*, **1992**, *48*, 5731.

S. Berger, W. Bock, C. F. Marth, M. T. Reetz, "Titanium-47,49 NMR of some titanium compounds", *Magn. Reson. Chem.* **1990**, 28(6), 559-60.

E. Vedejs and C. F. Marth, "The Mechanism of the Wittig Reaction: Evidence Against Betaine Intermediates", *J. Amer. Chem. Soc*. **1990**, *112*, 3905.

E. Vedejs and C. F. Marth, "Oxaphosphetane Pseudorotation: Rates and Mechanistic Significance in the Wittig Reaction", *J. Am. Chem. Soc.* **1989**, *111*, 1519.

E. Vedejs, C. F. Marth, and R. Ruggeri, "Substituent Effects and the Wittig Mechanism: The Case for Stereospecific Oxaphosphetane Decomposition", *J. Am. Chem. Soc.* **1988**, *110*, 3941.

E. Vedejs and C. F. Marth, "The Mechanism of the Wittig Reaction: The Role of Substituents at Phosphorus", *J. Am. Chem. Soc.* **1988**, *110*, 3949.

INTERESTS

I enjoy hiking, singingr, and woodworking. Traveling and meeting new people are both very rewarding for me. I also have an interest in history, foreign affairs, and the German language.

References available upon request.

ARTHUR L. SALIDO
Assistant Professor, Department of Chemistry and Physics
Western Carolina University, 416 Stillwell, Cullowhee, NC 28723
(828) 227-2587, salido@wcu.edu

EDUCATION

December 2011	**MBA, Western Carolina University** Cullowhee, NC
April 1999	**Ph.D., Analytical Chemistry, Wake Forest University** Winston-Salem, North Carolina
May 1994	**B.A., Chemistry, Vanderbilt University** Nashville, Tennessee

EMPLOYMENT HISTORY

August 2006 - present	**Assistant Professor** Western Carolina University, Cullowhee, NC.
August 2002 - 2006	**Assistant Professor** Mercer University, Macon, GA.
August 2000 - 2002	**Visiting Assistant Professor** Western Carolina University, Cullowhee, NC.
August 1999 - 2000	**Chemistry Instructor** Western Carolina University, Cullowhee, NC.
February 1999 - June 1999	**Chemist** Charlotte Utilities Division, Charlotte, NC.
August 1995 - March 1996	**Research Internship** R.J. Reynolds Tobacco Co., Winston-Salem, NC.

SCHOLARSHIP

A. Grant Proposals Funded

August 2007 - August 2010	**A Portable Tungsten-Coil Atomic Emission Detector for Nuclear Forensics** **$300,000** from the National Science Foundation and the Department of Homeland Security: Domestic Nuclear Detection Office. The objectives of the project included: (1) design and assembly of a portable tungsten coil atomic emission instrument that may be carried in one hand; (2) characterization of the system for the fast simultaneous determination of the nuclear forensic elements of interest (“dirty bomb” elements); and (3) development of specific methods for the analysis of nuclear forensic samples in the field. Typical sample types include dust, soil, water, and crops.
June 2008 - July 2008	**Summer Undergraduate Research Fellowship** **$6,000** from WCU to involve one undergraduate student, Collin Jones, in a 10 week summer research project. Collin presented his results at one regional (SERMACS) and one local research conference (Science in the Mountains).
August 2004 - August 2006	**Implementation of Inductively Coupled Plasma Optical Emission Spectrometry in Chemistry, Environmental Engineering, and Environmental Sciences Curricula** **$102,000** from the National Science Foundation’s “Course, Curriculum, and Laboratory

	Improvement" program. Funding was used to increase student-learning opportunities through the addition of Inductively-Coupled Plasma Optical Emission Spectrometry (ICPOES), to the Chemistry, Environmental Science, and Environmental Engineering curricula. This provided sufficient analytical capabilities to facilitate environmental inquiry, equip students with needed technological understanding, and build critical scientific skills. The new technology facilitated research into air and water contamination, metal cycling in wetlands, and environmental remediation of heavy metals. This project also promoted collaboration between undergraduates and local high school students, which improved community ties, accelerated high school students' college preparation, provided a mentoring context for undergraduates, and advanced future collaborations between the university and the local school system.
August 2003 - August 2004	**Integration of Peer-Led Team Learning in General Chemistry, CHM 111, at Mercer University** **$8,292** Workshop Project Associate (WPA) grant for the proposal, "Integration of Peer-Led Team Learning in General Chemistry, CHM 111, at Mercer University". The award was used to fund student-led "workshops" in chemistry that focused on the following areas: improving student learning, developing successful study skills, cultivating student mentors, and increasing student retention. The WPA grant was a sub-grant from the National Science Foundation.

C. Recent Publications

1. **Salido, A. L.**; Jones, B. T. "Determination of Sr in Soil by Tungsten Coil Atomic Emission Spectrometry" *Microchemical Journal* 2011, (accepted for publication).
2. **Salido, A. L.**; Jones, B. T. "The Use of Aluminum and Potassium as Modifiers to Improve the Determination of Strontium by Tungsten Coil Atomic Emission Spectrometry" *Analytical Letters* 2011, (accepted, to be published December, 2011).
3. Huffman, S. W.; **Salido, A. L.**; Evanoff, D. D. "Quantitative Infrared Spectroscopy in the Undergraduate Laboratory Via Multivariate Mixture Analysis of a Simulated Analgesic" *Spectroscopy Letters* 2010, 43(7), 539-544.
4. **Salido, A. L.**; Hyatt, D. "Optimization of Arsenic Speciation Conditions In Plant Material By HPLC-ICP-OES" *Spectroscopy Letters* 2007, 40(3).
5. Lim, J.; **Salido, A. L.**; Butcher, D. J. "Phytoremediation of Lead Using Indian Mustard (Brassica juncea) with EDTA and Electrodics" *Microchemical Journal* 2004, 76 (1/2).
6. **Salido, A. L.**; Hasty, K. L.; Lim, J.; Butcher, D. J. "Phytoremediation of Arsenic and Lead in Contaminated Soil Using Chinese Brake Ferns (*Pteris vittata*) and Indian Mustard (*Brassica juncea*)" *International Journal of Phytoremediation* 2003, 5 (2), 89-103.

D. Select Presentations

1. **Arthur Salido**, Collin Jones, Harrison Burke, Bradley T. Jones, "After a "Dirty Bomb": A Low-Cost, Field-Portable Instrument to Determine Sr in Environmental Samples" *The Pittsburg Conference*, Orlando, FL March 1, 2010.
2. **Invited Speaker: Arthur Salido**, "Development of Sample-Treatment Methods for the Characterization of Cobalt in Environmental Samples" *Academic Research Initiative Grantees Conference* April 21-22, 2008.
3. **Invited Speaker: Arthur Salido**, "A Portable Spectrometer for Nuclear Forensics" *Elon University,* April 18, 2008.
4. **Invited Speaker: Arthur Salido**, "NSF CCLI Help for Researchers at Predominantly Undergraduate Institutions" *The Pittsburg Conference*, New Orleans, LA, March 2, 2008.
5. **Arthur Salido**, "Arsenic Characterization in Plant Samples" *Southeastern Regional Meeting of the American Chemical Society*, Augusta, GA November, 2006.

Jack Stuart Summers, Ph.D.

Associate Professor
Department of Chemistry and Physics
Western Carolina University.
Cullowhee, NC 28723
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summers@email.wcu.edu

4989 Tilley Creek Rd
Cullowhee, NC 28723
(828) 293-7781

I am currently Associate Professor in the Department of Chemistry and Physics at Western Carolina University. My research interests include; 1.Structure / Activity relationships in models of biological oxidative stress, and 2. using novel NMR based assays in drug discovery and development. I received my Ph.D. in Chemistry, in 1989 from the Georgia Institute of Technology, where I worked with Prof. E. Kent Barefield. Before coming to WCU I engaged in post-doctoral academic and industrial biotechnology research. As a Senior Scientist at Message Pharmaceuticals, Inc, I studied the biophysical chemistry of RNA / ligand interactions. I have consulted for biotechnology companies and have engaged in post-doctoral research at Duke University with Alvin Crumbliss, at NC State University with Robert Osteryoung and at West Virginia University with Alan Stolzenberg.

RESEARCH EXPERIENCE

- 2003 – present: Associate Professor, Western Carolina University. Biophysical chemistry related to oxidative stress. Chemical kinetics. Inhibition of Superoxide Dismutase enzymes by low molecular weight compounds, Roles of metal ions in antibiotic behaviors of medicinal clays.
- 2001-2003: Senior Scientist at Message Pharmaceuticals (Malvern, PA). Biophysical chemistry of drug lead / protein / RNA interactions, determined lead targets and mechanisms of action. This work was the subject of a US Patent and a manuscript published in *J. Am. Chem. Soc*.
- 1999 – 2001: Dynamic NMR methods for studying metalloproteins, with Alvin L. Crumbliss, Duke University, Durham, NC. Dr. Summers wrote the NIH R21 grant proposal that supported this project, conducted laboratory work and directed the efforts of undergraduates, graduate students, and post-docs.
- 1996 – 1999: Chemistry of boranophosphate diesters and linkage modified DNA, with Barbara Ramsay-Shaw, Duke University, Durham, NC.
- 1994 – 1995: Chemistry of acidic species in ambient temperature ionic liquids, with Robert Osteryoung, North Carolina State University, Raleigh, NC.
- 1990 – 1994: Synthesis, characterization, and reactivity of porphyrin and hydroporphyrin complexes of Ni, Zn, Co, and Pd, with Professor Alan Stolzenberg, West Virginia University, Morgantown, WV.
- 1990 Dissertation project: Reactions of carbon dioxide with low valent complexes of cobalt and nickel.

TEACHING EXPERIENCE:

- 2003 – present: Assistant / Associate Professor, Western Carolina University, Taught Lecture courses; General Chemistry, Inorganic, Liberal Studies Chemistry, General Chemistry Labs, Synthesis Lab.
- 1995: Adjunct Assistant Professor, North Carolina Central University, Durham, NC,
- 1989: Adjunct Assistant Professor, West Georgia College, Carrollton, GA,.

GRANTS

Funded, NIH R15 AREA Proposal; Discovery and development of superoxide dismutase inhibitors; $250,000 Direct costs, ~$75,000 Indirect costs, PI Jack Summers. June 2010 – May 2013

Funded: Basic Research Grant from the North Carolina Biotechnology Center; Superoxide dismutase inhibition and its affect on bacteria, $60,000 for 18 months, Co-PIs Jack Summers and Lori Seischab, July 2009-Jan 2011.

Unfunded: Research Corp. Cottrell College Awards (two proposals), Petroleum Research Fund (three proposals)

PATENT ACTIVITIES:

1. Jack S. Summers, US Patent Application, *Methods for predicting the reactivities of metal complexes toward catalyzing biological oxidation / reduction reactions.* Full patent application filed September, **2008**. Provisional application filed September, **2007**. Current status: The university dropped the ball on this one. They missed a deadline for responding to an action from a patent examiner and the application died.
2. Jack S. Summers, Anthony Giordano, Michael Sturgess, and John Shimko, *Methods for detecting and quantifying binding and inhibition of binding of species to nucleic acids.* US Patent #US 7,037,660 B2, May 2, **2006**.

MANUSCRIPT SUBMITTED FOR PUBLICATION: Jack S. Summers, Benjamin Hickman, Megan E. Arrington, Michelle R. Yost, Mariah K. Hornby, Jeffrey D. Schmitt, Jonathan G. Markley, Brandon G. Wilson, Inhibition of CuZnSOD by flavonoids, Submitted to *J. Natl. Prod*., March 2011-Revised and resubmitted September 2011.

PUBLICATIONS:

Note; underline signifies undergraduate co-authors mentored by Dr. Summers.

1. Cunningham, T. M., J. Koehl, J. S. Summers, and S. E. Haydel. pH-dependent metal ion toxicity influences the antibacterial activity of two natural mineral mixtures. *PLoS ONE*, **2010** (http://dx.plos.org/10.1371/journal.pone.0009456).
2. Jack S. Summers*, Joseph B. Baker, Dan Meyerstein, Amir Mizrahi, Israel Zilberman, Haim Cohen, Christopher M. Wilson, Jamie R. Jones, Measured Rates of Fluoride / Metal Association Correlate with Rates of Superoxide / Metal Reactions for $Fe^{III}EDTA(H_2O)^-$ and Related Complexes. *J. Amer. Chem. Soc.,* **2008***, 130*, 1727.
3. Jack S. Summers*, Karel Base, Hakim Boukhalfa, Jason E. Payne, Barbara Ramsay Shaw, and Alvin L. Crumbliss, The Use of Phosphorus Ligand NMR Probes to Investigate Electronic and Second-Sphere Solvent Effects in Ligand Substitution Reactions at Manganese(II) and Manganese(III). *Inorg. Chem.,* **2005** *, 44*, 3405-3411.
4. Jack S. Summers,* John Shimko, Fredric L. Freedman, Christopher T. Badger, and Michael Sturgess. Displacement of Mn^{2+} from RNA by K^+, Mg^{2+}, Neomycin b, and an Arginine Rich Peptide: Indirect Detection of Nucleic Acid / Ligand Interactions using Phosphorus Relaxation Enhancement (PhoRE), *J. Am. Chem. Soc.,* **2002***, 124*, 14934-14939.
5. Jack S. Summers*, Charles G. Hoogstraten, R. David Britt, Karel Base, Barbara Ramsay Shaw, Anthony A. Ribeiro, and Alvin L. Crumbliss, ^{31}P NMR Probes of Chemical Dynamics: Paramagnetic Relaxation Enhancement of the ^{1}H and ^{31}P NMR Resonances of Methylphosphite and Methylethylphosphate Anions by Selected Metal Complexes. *Inorg. Chem.,* **2001***, 40*, 6547-6554.
6. Jack S. Summers and Barbara Ramsay Shaw, Boranophosphates as Mimics of Natural Phosphodiesters in DNA, *Curr. Med. Chem.* **2001***, 8*, 1147-1156.
7. Sergueeva, Z. A., Sergueev, D. S., Ribeiro, A. A. Summers, J. S., and Shaw, B. R., Individual isomers of Dinucleoside Boranophosphates as synthons for incorporation into oligonucleotides. Synthesis and configurational assignment. *Helv. Chim. Acta,* **2000***, 83*, 1377-1391.
8. Alan M. Stolzenberg and Jack S. Summers, Cis-Influence of Hydroporphyrin macrocycles on axial ligation equiibria and alkyl exchange reactions of alkylcobalt(III) porphyrin *complexes Inorg. Chem.,* **2000***, 39,* 1518-1524.
9. Shaw, B. R., Sergueev, D. He, K., Porter, K., Summers, J. S., Sergueeva, Z., and Rait, V.,Boranophosphate Backbone: A Mimic of Phosphodiesters, Phosphorothioates and Methyl Phosphonates., *Meth. Enzymol.,* **1999***, 313*, 226-257.
10. Jack S. Summers, Kenneth W. Porter, Than-Thu Tran, and Barbara Ramsay Shaw. Chemical cleavage of boranophosphate substituted DNA under mild conditions. US Patent filed, 1999.

11. Vladimir Rait, Dmitri Sergueev, Jack Summers, Kaizhang He, Faqing Huang, Bozenna Krzyznowska, and Barbara Ramsay Shaw, Boranophosphate nucleic acids – A versitile DNA backbone, *Nucleosides & Nucleotides,* **1999***, 18*, 1379-1380.

12. Jack S. Summers, Diana Roe, Paul D. Boyle, Michael Colvin, and Barbara Ramsay Shaw. Structural studies of a borane modified phosphate diester linkage: Ab initio calculations on the dimethylboranophosphate anion, and the single crystal X-ray structure of its diisopropylammonium salt. *Inorg. Chem.,* **1998***, 37*, 4158-4159.

13. Jack S. Summers, Jeffrey L. Petersen, and Alan M. Stolzenberg. A Comparison of the Structures of the Five-Coordinate Cobalt(II) Pyridine-, Five-Coordinate Cobalt(III) Methyl-, and Six-Coordinate Cobalt(III) Methyl Pyridine Complexes of Octaethylporphyrin*.* *J. Am. Chem. Soc.,* **1994***, 116*, 7189.

14. Jack S. Summers and Alan M. Stolzenberg., The Cis-Influence of Hydroporphyrin Macrocycles on the Axial Ligation Equilibria of Cobalt(II) and Zinc(II) Porphyrin Complexes. *J. Am. Chem. Soc.,* **1993***, 115*, 10559

15. Alan M. Stolzenberg, Leonard J. Suschel, Jack S. Summers, Bruce M. Foxman, and Jeffrey L. Petersen. The Structures of the Homologous Series of Square-Planar Metallotetrapyroles (2,3,7,8,12,13,17,18-Octaethylporphyrinato)palladium(II), (trans-2,3-Dihydro-octaethyl-porphyrinato) palladium(II), and(tct-2,3,7,8-Tetrahydro-octaethylporphyrinato) palladium (II). *Inorg. Chem.,* **1992***, 31,* 1678.

16. Goutam S. Laheri, Jack S. Summers, and Alan M. Stolzenberg, A Superior Method for Metallation of Hydroporphyrins. Inorg. Chem., 1991, 30, 5049.

17. E. Kent Barefield, Antonio Bianchi, E. Joseph Billo, Peter Connolly, Piero Paoletti, Jack S. Summers, and Donald G. Vanderveer, Thermodynamics and Structural Studies of Configurational Isomers of Ni(cyclam)2+. *Inorg. Chem.,* **1986***, 25*, 4197.

INTERNATIONAL PRESENTATIONS:

Jack S. Summers*, Joseph B. Baker, Dan Meyerstein, Amir Mizrahi, Israel Zilberman, Haim Cohen, Christopher M. Wilson, Jamie R. Jones, Evidence that $Fe^{III}EDTA(H_2O)^-$ and Related Complexes React with Superoxide by Inner Sphere Process. ***38th International Conference on Coordination Chemistry,*** Jerusalem Israel, July 21, 2008.

NATIONAL PRESENTATIONS AND POSTERS SINCE 2010:

Benjamin Hickman, Megan Arrington, Michelle Yost, Mariah Hornby, Jack Summers Inhibition of CuZnSOD by low MW natural products. *240th National meeting of the American Chemical Society*, Boston, MA, August 22, 2010.

Megan Arrington, Michelle Yost, Mariah Hornby, Jonathan Markley, Erin Parris, Jeff Schmitt, Jack Summers. Superoxide Dismutase Inhibition Screening and Characterization Using 19F NMR *240th National meeting of the American Chemical Society,* Boston, MA, August 24, 2010.

INVITED SEMINARS

Spring 2011 Science in the Mountains, Asheville, NC.

Fall 2009; Charlotte Biotechnology Conference.

INVITED SEMINARS TO UNIVERSITY CHEMISTRY DEPARTMENTS:

Fall 2010 University of Georgia (Athens, GA)

Fall 2008 Georgia Tech (Atlanta, GA)

Fall 2008 Emory (Atlanta, GA)

Winston Salem State Univeristy (Winston Salem, NC)

FEDERAL GRANT PROPOSAL PEER REVIEWER

2011 NSF Research Proposal: Reviewed research grant proposal at the request of Dr Deborah Aruguete, Associate Program Director.

2009 NSF Major Research Instrumentation (MRI); Served on a panel to review MRI proposals for NMR spectrometers.

2008 NSF Research at Undergraduate Institutions (RUI); Reviewed two RUI proposals at the request of Lou Marzilli

2005 NSF Post doctoral award; Reviewed one proposal

Manuscripts Reviewed for Journal Publications

Fall 2003, reviewed manuscript for *J. Amer. Chem. Soc* at the request of editor F. Ann Walker

Spring 2004, reviewed manscript for *Inorg. Chem*. At the request of editor Vincent Pecararo.

Graduate Student Advisor

Britt Bintz; MS-2006, Iron binding by hyaluronic acid.

Megan Arrington; MS-2009, Mechanistic studies of CuZnSOD inhibition by flavonols.

Jonathan Markley, MS-2009, Screening and characterization of compounds for inhibition of CuZnSOD.

Benjamin Hickman, MS-2012, Synthesis of gallate esters and laboratory and computational characterizations of their interactions with CuZnSOD.

Michael Moore (left program without MS degree).

Mrudulatha Matukumalli (left program)

Lisa Bernier (left program for Physician's Assistant program at Emory University)

Undergraduate Research Advisor

2011-2012

Brandon Wilson (Spring), characterizing inhibition of CuZnSOD by 1,2-dithiobenzene

Virginia Hopkins (Spring), characterizing inhibition by gallic acid

Kyle Fulle (Spring), Synthesis of ortho-dithophenols.

Kandyce Johnson (Spring), inhibition by benzene dithiol

Stacy Sprague (Spring) binding constants for 2-mercaptophenol

Tess Brannon (Summer)

2010-2011

Brandon Wilson (Summer, Fall), characterizing inhibition of CuZnSOD by 1,2-dithiobenzene

Virginia Hopkins (Fall), characterizing inhibition by gallic acid

Benjamin Hickman (Spring, Summer, Fall), Synthesis of gallate esters and laboratory and computational characterizations of their interactions with CuZnSOD.

Mariah Hornby (Summer), characterizing enzyme / flavonol interactions

2009-2010

Benjamin Hickman

Kristin Beeker

Erin Parris

Amanda Nance

Cory Harrington

2008-2009

Erin Waugh

Carmen Bachelor

Michelle Yost

2007-2008

Michael Moore

Carmen Bachelor

Emily Nantz

Sam Birchfiled

Michelle Yost

2006-2007

Christopher Wilson

Jamie Jones

Joseph Baker

Lauren Rogers

Theresa Tate

2005-2006

Christopher Wilson

Joseph Baker

2004-2005

Christopher Wilson

John Walser

Corey Meyer

Jamie Jones

MEMBER OF THESIS COMMITTEES FOR MS CANDIDATES:

Shanna Weathersby

Amanda Schoonover

Stephen Ballew

Alisha Hunter

Malia Gonzales

Jennifer Patterson

Stacy Poston

Michelle Benoist

Wesley Whitfiled

Patrick Baldwin

Lisa Clark

Ralph Patterson

UNIVERSITY SERVICE

2010-2011 Chair, Faculty Task Force on Research Funding.

2006-2009; Faculty Senate

2009: Provost's Task Force on College Realignment

2008: Chair; Committee to Revise University Patent Policy.

COLLEGE SERVICE:

2011 College Tenure, Promotion and Reappointment Committee

2005: Dean's Advisory Committee

DEPARTMENT SERVICE

2010- 2011: Chair, Annual Faculty Evaluation Committee

2011- Nominated by the department to serve on University Program Realignment Task Force

2004: Chair, Department curriculum committee.

COMPREHENSIVE CURRICULUM VITAE
Michael W. Van Dyke, Ph.D.

PRESENT TITLE AND AFFILIATION

Primary Appointment

Associate Professor, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC

CITIZENSHIP

United States of America

OFFICE ADDRESS

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111 Memorial Drive
Cullowhee, NC 28723
Room Number: NS 332
Phone: (828) 227-2286
Fax: (828) 227-7502
Email: mvandyke@email.wcu.edu

EDUCATION

Degree-Granting Education

1. Monmouth College, Monmouth, IL, B.A., Magna Cum Laude, 1979, Chemistry, Physics
2. California Institute of Technology, Pasadena, CA, Ph.D., 1984, Organic Chemistry

Postgraduate Training

3. Research Fellowship, Biochemistry & Molecular Biology, The Rockefeller University, New York, NY, Robert G. Roeder, Ph.D., 2/1984−1/1987

EXPERIENCE/SERVICE

Academic Appointments

1. Research Associate, Laboratory of Biochemistry and Molecular Biology, The Rockefeller University, New York, NY, 2/1987−1/1988
2. Senior Research Associate, Laboratory of Biochemistry and Molecular Biology, The Rockefeller University, New York, NY, 2/1988−12/1988
3. Assistant Biologist, Department of Tumor Biology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 1/1989−8/1995
4. Assistant Professor, Department of Tumor Biology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 1/1989−8/1995
5. Faculty, The University of Texas Graduate School of Biomedical Sciences, Houston, TX, 8/1989−8/2010
6. Associate Biologist, Department of Tumor Biology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 9/1995−8/1998
7. Associate Professor, Department of Tumor Biology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 9/1995−8/1998
8. Associate Biologist, Department of Cancer Biology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 9/1998−12/1999
9. Associate Professor, Department of Cancer Biology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 9/1998−12/1999
10. Associate Professor, Department of Molecular and Cellular Oncology, Division of Basic Science Research, The University of Texas M. D. Anderson Cancer Center, Houston, TX, 1/2000−8/2010
11. Associate Professor, Department of Chemistry and Physics, Western Carolina University, Cullowhee, NC, 8/2010–present

Other Appointments/Responsibilities

1. Technician, Abbott Laboratories, Department of Biomedical Engineering, North Chicago, IL, 11/1978−12/1978
2. Summer Intern, Monsanto Corporation, Phosphates & Detergents Division, St. Louis, MO, 6/1979−8/1979

Consultantships

1. GeneSoft, Inc., S. San Francisco, CA, Consultant, 9/1999−1/2004
2. Reuters Insight, London, UK, Consultant, 5/2008−8/2010

Institutional Committee Activities

1. UTMDACC, Research Medical Library Advisory Committee, Member, 9/1992−8/1993
2. UTMDACC, Research Medical Library Advisory Committee, Chair, 9/1993−8/1994
3. UTMDACC, Curriculum Committee for College Summer Trainees, Member, 9/1993−8/1995
4. The University of Texas Graduate School of Biomedical Sciences, Executive Committee, Cancer Biology Program, Member, 9/1994−3/1998
5. UTMDACC, Institutional Research Support Committee, Member, 9/1997−8/1998
6. UTMDACC, Physicians Referral Service Scientific Review Committee, Member, 6/1998−7/1999
7. UTMDACC, Institutional Research Support Committee, Vice-Chair, 9/1998−8/1999
8. UTMDACC, Study Section Review Committee for Basic Research Projects, Chair, 9/1999−8/2000
9. The University of Texas Graduate School of Biomedical Sciences, Curriculum Committee, Member, 9/1999−8/2001
10. The University of Texas Graduate School of Biomedical Sciences, Curriculum Committee, Chair, 9/2001−8/2002
11. The University of Texas Graduate School of Biomedical Sciences, Executive Committee, Member, 9/2001−8/2002
12. UTMDACC, Conflict Management Advisory Committee, Member, 9/2003−8/2007
13. UTMDACC, Faculty Senate, Member, 9/2005−8/2008
14. UTMDACC, Enterprise Internet Strategy Steering Team, Physician & Scientist Workgroup, Member, 2/2008−8/2010
15. The University of Texas Graduate School of Biomedical Sciences, Cancer Biology Program, Executive Committee, Member, 9/2008−8/2010

HONORS AND AWARDS

1. Monmouth College Honor Scholarship, Monmouth College, 1976
2. Garrett W. Thiesson Memorial Scholarship, Monmouth College, 1977
3. J.F. Watson Scholarship, Monmouth College, 1978
4. Bachelor of Arts, magna cum laude, Monmouth College, 1979
5. Lubrizol Scholarship, Monmouth College, 1979
6. Exxon Education Foundation Fellowship, California Institute of Technology, 1980
7. National Research Service Award, Predoctoral, NIH, 1980−1983
8. Shell Companies Foundation Fellowship, California Institute of Technology, 1980−1981
9. William Barton Jones Trust Fellowship, California Institute of Technology, 1982−1983
10. National Research Service Award, Postdoctoral, NIH, 1984−1987
11. Dean's Teaching Award, The University of Texas Graduate School of Biomedical Sciences, 1993
12. Dean's Excellence Award, The University of Texas Graduate School of Biomedical Sciences, 1995, 1996, 1997, 1999, 2000, 2001
13. Outstanding Faculty Award, The University of Texas Graduate School of Biomedical Sciences, 1999
14. Health Science Center Honors Convocation Recipient, The University of Texas Graduate School of Biomedical Sciences, 2001, 2003
15. Reappointment to the UT GSBS Faculty with Highest Commendation, The University of Texas Graduate School of Biomedical Sciences, 2002

16. Outstanding Educator Award, The University of Texas M. D. Anderson Cancer Center, 2003

RESEARCH

Grants and Contracts

Active

1. Principal Investigator, Catherine Denning: Structural Studies of the Stress-response Translation Regulator Stm1p, North Carolina Biotechnology Center, 5/1/2011−4/30/2012, $5,000 ($5,000/year)

Completed

1. Investigator, Transcription Activation Mechanisms of Class II Genes, NIH/NCI, 7/1/1989−6/30/1990, $27,800 ($27,800/year)
2. Principal Investigator, Human Transcription Factor TFIID, MDACC, 12/1/1989−11/30/1990, $10,000 ($10,000/year)
3. Principal Investigator, The Chemistry of Transcription Factor TFIID, G-1199, The Robert A. Welch Foundation, 6/1/1990−5/31/1993, $90,000 ($30,000/year)
4. Principal Investigator, Mithramycin and c-Myc Gene Expression, Wendy Will Case Cancer Fund, 7/1/1990−6/30/1991, $20,000 ($20,000/year)
5. Principal Investigator, Mithramycin and c-Myc Gene Expression, CH-505, American Cancer Society (ACS), 1/1/1991−12/31/1993, $205,000 ($68,333/year)
6. Principal Investigator, Isolation and Characterization of TFIID-associated Proteins, 3110, Council for Tobacco Research, 7/1/1991−6/30/1994, $201,500 ($67,167/year)
7. Investigator, Synthetic Gene-Specific Transcription Inhibitors, NIH/NCI, 9/1/1992−6/30/1994, $28,000 ($28,000/year)
8. Principal Investigator, The Chemistry of Transcription Factor TFIID, G-1199, The Robert A. Welch Foundation, 6/1/1993−5/31/1996, $91,500 ($30,500/year)
9. Principal Investigator, Mechanism of Basal Transcription Inhibition by Triplexes, G-1199, The Robert A. Welch Foundation, 6/1/1996−5/31/1999, $102,000 ($34,000/year)
10. Principal Investigator, Combinatorial Survey of Aureolic Acid Antineoplastics, Physicians' Referral Service, 12/1/1996−11/30/1998, $46,420 ($23,210/year)
11. Principal Investigator, Molecular Recognition of DNA-Binding Antibiotics, RPG-97-028-01-DHP, American Cancer Society, 1/1/1997−12/31/1999, $126,000 ($63,000/year)
12. Principal Investigator, The Biochemistry of Triplex-Binding Proteins, G-1199, The Robert A. Welch Foundation, 6/1/1999−5/31/2002, $135,000 ($45,000/year)
13. Principal Investigator, Molecular Recognition of DNA-Binding Antibiotics, RPG-97-028-03-LBC, American Cancer Society, 7/1/1999−12/31/2002, $113,000 ($56,000/year)
14. Principal Investigator, G*G Multiplex DNA-Binding Proteins in Human Cells, University Cancer Foundation, 5/1/2001−8/31/2002, $49,980 ($49,980/year)
15. Principal Investigator, RNA G*G Multiplexes and their Recognition by Proteins, G-1199, The Robert A. Welch Foundation, 6/1/2002−5/31/2005, $150,000 ($50,000/year)
16. Principal Investigator, Therapeutic Potential of Dominant-Negative NF-kB in Pancreatic Cancer, The Topfer Fund for Pancreatic Cancer Research, 9/1/2002−8/31/2003, $49,940 ($49,940/year)
17. Principal Investigator, Inhibition of RelA in Pancreatic Cancer Cells by Short, Interfering RNAs, Commonwealth Cancer Foundation Target Discovery Grant, 11/1/2002−10/31/2004, $141,256 ($70,628/year)
18. Principal Investigator, Therapeutic Potential of Dominant-Negative NF-kappaB in Lung Cancer, Tobacco Settlement Award Funds, 1/1/2003−12/31/2004, $141,256 ($70,628/year)
19. Principal Investigator, Abolition of Histone Deacetylases by Activated NF-kappaB in Breast Cancer, BC032339, DOD/Congressionally Directed Medical Research Programs (DOD/CDMRP), 8/1/2004−7/31/2005, $113,250 ($113,250/year)
20. Principal Investigator, Target Discovery in Breast Cancer Cells with Dominant-Repressive Transcription Factor Chimeras, Commonwealth Cancer Foundation Target Discovery Grant, 11/1/2004−10/31/2005, $68,580 ($68,580/year)

21. Principal Investigator, Native Nucleic Acid Recognition by Yeast G*G Multiplex-binding Proteins, G-1199, The Robert A. Welch Foundation, 6/1/2005−5/31/2008, $150,000 ($50,000/year)
22. Principal Investigator, VG0604a: A Multimodal Agent against Acute Myelogenous Leukemia, The Mike Hogg Fund, 1/1/2006−3/31/2007, $15,000 ($15,000/year)
23. Principal Investigator, Stm1p, a TOR-responsive Translation Regulator in Yeast, MDACC, 7/1/2006−6/30/2008, $50,000 ($25,000/year)
24. Principal Investigator, A Multimodal Agent against Acute Myelogenous Leukemia, Ladies Leukemia League, 6/1/2007−11/30/2008, $25,000 ($25,000/year)
25. Principal Investigator, 20%, Sesquiterpene Lactones: Aspirins for Breast Cancer, BCTR0600663, Susan G. Komen Breast Cancer Foundation, 5/1/2006−4/30/2010, $132,800 ($66,400/year)
26. Principal Investigator, Sesquiterpene Lactones: Multimodal Agents against Chronic Myelogenous Leukemia, CM064022, DOD/Congressionally Directed Medical Research Programs (DOD/CDMRP), 8/1/2007−7/31/2010, $150,000 ($75,000/year)
27. Principal Investigator, MicroRNA Derepression by the Adenylate/Uridylate-Rich Element Binding Protein Nucleolin, The Robert A. Welch Foundation, 6/1/2008−8/31/2010, $150,000 ($50,000/year)

Grant Reviewer/Service on Study Sections

1. Nucleic Acids and Protein Synthesis Advisory Committee, American Cancer Society, External Reviewer, 1994
2. Oncology Review Subcommittee, Department of Veterans Affairs, Member, 1996−2001
3. Biochemistry of Gene Expression, National Science Foundation, External Reviewer, 1999−2000
4. ZRG1 PTHB 01 M Scientific Review Group, National Institutes of Health, Ad Hoc Member, 2000
5. Research, Susan G. Komen Breast Cancer Research Foundation, External Reviewer, 2001
6. Research, American Chemical Society, Petroleum Research Fund, External Reviewer, 2001
7. Breast Cancer Pathobiology (PBY-5), Department of Defense, Member, 2002
8. BC02 Concept-6, Department of Defense, Scientist Reviewer, 2003
9. BC03 Adhoc-2, Department of Defense, Scientist Reviewer, 2004
10. BC03 Concept PBY-1, Department of Defense, Scientist Reviewer, 2004
11. Genes and Genome Systems Cluster, Molecular & Cellular Biology, National Science Foundation, External Reviewer, 2006
12. Scholarship Panel, Sowell Huggins Endowment Fund, Member, 2006
13. Treatment, Susan G. Komen Breast Cancer Foundation, Scientist Reviewer, 2006
14. Center for Targeted Therapy, UT M. D. Anderson Cancer Center, Reviewer, 2007−2008
15. PDFSci07, Susan G. Komen Breast Cancer Foundation, Member, 2007
16. Research, U.S. Civilian Research & Development Foundation, External Reviewer, 2007
17. Reumafonds, Dutch Arthritis Foundation, Reviewer, 2007
18. Research, The Welcome Trust, External Reviewer, 2008
19. Breast Cancer Pathobiology, Department of Defense, Member, 2009–2010
20. Postdoctoral Fellowships in Genetics (PDFB-5), Susan G. Komen Breast Cancer Research Foundation, Member, 2009−2010
21. KWF Kankerbestrijding, Dutch Cancer Society, Reviewer, 2009
22. Idea Resubmission-Pathobiology, Susan G. Komen Breast Cancer Research Foundation, Member, 2010
23. Bankhead-Coley Cancer Research Program, Florida Department of Health, Reviewer, 2010
24. James and Esther King Biomedical Research Program, Florida Department of Health, Reviewer, 2010
25. Training-Cell Biology-C, Department of Defense, Member, 2010
26. Training-Endocrinology/Immunology, Department of Defense, Ad hoc Member, 2010

PUBLICATIONS

Peer-Reviewed Original Research Articles (Corresponding author)

1. Van Dyke MW, Hertzberg RP, Dervan PB. Map of distamycin, netropsin, and actinomycin binding sites on heterogeneous DNA: DNA cleavage-inhibition patterns with methidiumpropyl-EDTA·Fe(II). Proc Natl Acad Sci USA 79(18):5470-4, 9/1982.
2. Van Dyke MW, Dervan PB. Chromomycin, mithramycin, and olivomycin binding sites on heterogeneous deoxyribonucleic acid. Footprinting with (methidiumpropyl-EDTA)iron(II). Biochemistry 22(10):2373-7, 5/1983.
3. Van Dyke MW, Dervan PB. Methidiumpropyl-EDTA.Fe(II) and DNase I footprinting report different small molecule binding site sizes on DNA. Nucleic Acids Res 11(16):5555-67, 8/1983.
4. Van Dyke MM, Dervan PB. Echinomycin binding sites on DNA. Science 225(4667):1122-7, 9/1984.
5. Van Dyke MW, Roeder RG. Multiple proteins bind to VA RNA genes of adenovirus type 2. Mol Cell Biol 7(3):1021-31, 3/1987.
6. Van Dyke MW, Roeder RG. Novobiocin interferes with the binding of transcription factors TFIIIA and TFIIIC to the promoters of class III genes. Nucleic Acids Res 15(11):4365-74, 6/1987.
7. Van Dyke MW, Roeder RG. Two classes of transcription factor TFIIIC in extracts from HeLa cells. Nucleic Acids Res 15:5031-9, 7/1987.
8. Sawadogo M, Van Dyke MW, Gregor PD, Roeder RG. Multiple forms of the human gene-specific transcription factor USF. I. Complete purification and identification of USF from HeLa cell nuclei. J Biol Chem 263(24):11985-93, 8/1988.
9. Van Dyke MW, Roeder RG, Sawadogo M. A physical analysis of transcription preinitiation complex assembly on a class II gene promoter. Science 241:1335-8, 9/1988.
10. Van Dyke MW, Sawadogo M, Roeder RG. Stability of transcription complexes on class II genes. Mol Cell Biol 9(1):342-4, 1989.
11. Van Dyke MW, Sawadogo M. DNA-binding and transcriptional properties of human transcription factor TFIID after mild proteolysis. Mol Cell Biol 10(7):3415-20, 7/1990.
12. Sawadogo M, Van Dyke MW. A rapid method for the purification of deprotected oligodeoxynucleotides. Nucleic Acids Res 19(3):674, 2/1991.
13. Van Dyke MW, Sirito M, Sawadogo M. Single-step purification of bacterially expressed polypeptides containing an oligo-histidine domain. Gene 111(1):99-104, 2/1992.
14. Hardenbol P, Van Dyke MW. Mithramycin is a non-specific inhibitor of transcription. Biochem Biophys Res Commun 185(2):553-8, 6/1992.
15. Buettner R, Kannan P, Imhof A, Bauer R, Yim SO, Glockshuber R, Van Dyke MW, Tainsky MA. An alternatively spliced mRNA from the AP-2 gene encodes a negative regulator of transcriptional activation by AP-2. Mol Cell Biol 13(7):4174-85, 7/1993.
16. Lu T, Van Dyke M, Sawadogo M. Protein-protein interaction studies using immobilized oligohistidine fusion proteins. Anal Biochem 213(2):318-22, 9/1993.
17. Wang JC, Van Dyke MW. Initiator sequences direct downstream promoter binding by human transcription factor IID. Biochim Biophys Acta 1216(1):73-80, 10/1993.
18. Cheng AJ, Van Dyke MW. Monovalent cation effects on intermolecular purine-purine-pyrimidine triple-helix formation. Nucleic Acids Res 21(24):5630-5, 12/1993.
19. Wang JC, Van Dyke MW. Sp1, USF, and GAL4 activate transcription independently of TFIID-downstream promoter interactions. Biochim Biophys Acta 1218(3):308-14, 8/1994.
20. Cheng AJ, Van Dyke MW. Oligodeoxyribonucleotide length and sequence effects on intermolecular purine-purine-pyrimidine triple-helix formation. Nucleic Acids Res 22(22):4742-7, 11/1994.
21. Musso M, Van Dyke MW. Polyamine effects on purine-purine-pyrimidine triple helix formation by phosphodiester and phosphorothioate oligodeoxyribonucleotides. Nucleic Acids Res 23(12):2320-7, 6/1995.
22. Musso M, Van Dyke MW. Torsionally-strained DNA and intermolecular purine-purine-pyrimidine triple-helix formation. Mol Cell Biochem 154(1):65-70, 1/1996.
23. Hardenbol P, Van Dyke MW. Sequence specificity of triplex DNA formation: Analysis by a combinatorial approach, restriction endonuclease protection selection and amplification. Proc Natl Acad Sci USA 93(7):2811-6, 4/1996.

24. Musso M, Wang JC, Van Dyke MW. In vivo persistence of DNA triple helices containing psoralen-conjugated oligodeoxyribonucleotides. Nucleic Acids Res 24(24):4924-32, 12/1996.
25. Musso M, Thomas T, Shirahata A, Sigal LH, Van Dyke MW, Thomas TJ. Effects of chain length modification and bis(ethyl) substitution of spermine analogs on purine-purine-pyrimidine triplex DNA stabilization, aggregation, and conformational transitions. Biochemistry 36(6):1441-9, 2/1997.
26. Hardenbol P, Wang JC, Van Dyke MW. Identification of preferred hTBP DNA binding sites by the combinatorial method REPSA. Nucleic Acids Res 25(16):3339-44, 8/1997.
27. Hardenbol P, Wang JC, Van Dyke MW. Identification of preferred distamycin-DNA binding sites by the combinatorial method REPSA. Bioconjug Chem 8(5):617-20, 9/1997.
28. Cheng AJ, Van Dyke MW. Oligodeoxyribonucleotide length and sequence effects on intramolecular and intermolecular G-quartet formation. Gene 197(1-2):253-60, 9/1997.
29. Musso M, Nelson LD, Van Dyke MW. Characterization of purine-motif triplex DNA-binding proteins in HeLa extracts. Biochemistry 37(9):3086-95, 3/1998.
30. Wang JC, Sawadogo M, Van Dyke MW. Plasmids for the in vitro analysis of RNA polymerase II-dependent transcription based on a G-free template. Biochim Biophys Acta 1397(2):141-5, 4/1998.
31. Szentirmay MN, Musso M, Van Dyke MW, Sawadogo M. Multiple rounds of transcription by RNA polymerase II at covalently cross-linked templates. Nucleic Acids Res 26(11):2754-60, 6/1998.
32. Cheng AJ, Wang JC, Van Dyke MW. Self-association of G-rich oligodeoxyribonucleotides under conditions promoting purine-motif triplex formation. Antisense Nucleic Acid Drug Dev 8(3):215-25, 6/1998.
33. Anthony T, Musso M, Hosseini MW, Brand G, Greenfield NJ, Thomas T, Van Dyke MW, Thomas TJ. Differential effects of cyclopolyamines on the stability and conformation of triplex DNA. Antisense Nucleic Acid Drug Dev 9:13-23, 2/1999.
34. Nelson LD, Musso M, Van Dyke MW. The yeast STM1 gene encodes a purine motif triple helical DNA-binding protein. J Biol Chem 275(8):5573-81, 2/2000.
35. Musso M, Bianchi-Scarra G, Van Dyke MW. The yeast CDP1 gene encodes a triple-helical DNA-binding protein. Nucleic Acids Res 28(21):4090-6, 11/2000.
36. Shen J, Wang JC, Van Dyke MW. Identification of preferred actinomycin-DNA binding sites by the combinatorial method REPSA. Bioorg Med Chem 9(9):2285-93, 9/2001.
37. Ciotti P, Van Dyke MW, Bianchi-Scarra G, Musso M. Characterization of a triplex DNA-binding protein encoded by an alternative reading frame of loricrin. Eur J Biochem 268(2):225-34, 2001.
38. Vashisht Gopal YN, Van Dyke MW. Combinatorial determination of sequence specificity for nanomolar DNA-binding hairpin polyamides. Biochemistry 42(22):6891-903, 6/2003.
39. Van Dyke MW, Nelson LD, Weilbaecher RG, Mehta DV. Stm1p, a G4 quadruplex and purine motif triplex nucleic acid-binding protein, interacts with ribosomes and subtelomeric Y' DNA in Saccharomyces cerevisiae. J Biol Chem 279(23):24323-33, 6/2004.
40. Sunavala-Dossabhoy G, Van Dyke MW. Combinatorial identification of a novel consensus sequence for the covalent DNA-binding polyamide tallimustine. Biochemistry 44(7):2510-22, 2/2005.
41. Vashisht Gopal YN, Arora TS, Van Dyke MW. Tumour necrosis factor-alpha depletes histone deacetylase 1 protein through IKK2. EMBO Rep 7(3):291-6, 3/2006.
42. Van Dyke N, Baby J, Van Dyke MW. Stm1p, a ribosome-associated protein, is important for protein synthesis in Saccharomyces cerevisiae under nutritional stress conditions. J Mol Biol 358(4):1023-31, 5/2006.
43. Vashisht Gopal YN, Arora TS, Van Dyke MW. Parthenolide Specifically Depletes Histone Deacetylase 1 Protein and Induces Cell Death through Ataxia Telangiectasia Mutated. Chem Biol 14(7):813-823, 7/2007.
44. Baby J, Pickering BF, Vashisht Gopal YN, Van Dyke MW. Constitutive and inducible nuclear factor-kB in immortalized normal human bronchial epithelial and non-small cell lung cancer cell lines. Cancer Lett 255(1):85-94, 9/2007.
45. Vashisht Gopal YN, Chanchorn E, Van Dyke MW. Parthenolide promotes the ubiquitination of MDM2 and activates p53 cellular functions. Mol Cancer Ther 8(3):552-562, 3/2009.

46. Van Dyke N, Pickering BF, Van Dyke MW. Stm1p alters the ribosome association of eukaryotic elongation factor 3 and affects translation elongation. Nucleic Acids Res 37(18):6116-6125, 10/2009.
47. Tonthat NK, Arold ST, Pickering BF, Van Dyke MW, Liang S, Lu Y, Beuria TK, Margolin W, Schumacher, MA. Molecular mechanism by which the nucleoid occlusion factor, SlmA, keeps cytokinesis in check. EMBO J 30(1):154-164, 1/2011.
48. Pickering BF, Yu D, Van Dyke MW. Nucleolin interacts with the microprocessor complex to affect microRNAs 15a and 16 biogenesis. J Biol Chem M111.265439, 11/2011.

Invited Articles (Corresponding author)
1. Van Dyke MW, Dervan PB. Footprinting with MPE·Fe(II). Complementary-strand analyses of distamycin- and actinomycin-binding sites on heterogeneous DNA. Cold Spring Harb Symp Quant Biol 47 Pt 1:347-53, 1983.
2. Reddy RHR, Van Dyke MW. Mithramycin is a non-specific inhibitor of c-Myc transcription. Mol Biol Life Sci Adv 12:23-27, 1993.
3. Sawadogo M, Van Dyke MW. Indirect use of immobilized metal affinity chromatography for isolation and characterization of protein partners. Genet Eng (NY) 17:53-65, 1995.
4. Vashisht Gopal YN, Van Dyke MW. Depletion of histone deacetylase 1 protein: A common consequence of inflammatory cytokine signaling? Cell Cycle 5(23):3522, 12/2006.
5. Van Dyke MW, Van Dyke N, Sunavala-Dossabhoy G. REPSA: General combinatorial approach for identifying preferred ligand-DNA binding sequences. Methods 42(2):118-127, 6/2007.
6. Van Dyke, MW. REPSA: combinatorial approach for identifying preferred drug-DNA binding sequences. Methods Mol. Biol. 613:193-205, 1/2010.

Other Articles (Corresponding author)
1. Boyd D, Van Dyke M. A career outcome study: Ph.D.s graduating in 1989 and 1970-1972 show substantial variation. The Scientist 14:39, 5/2000.

Abstracts (partial list)
1. Van Dyke MW, Wang JC. Mediation of transcription stimulation by USF and SP1 through TFIID-initiator interactions. J. Cell. Biochem 17A:96, 1993.
2. Hardenbol P, Van Dyke MW. Determination of triplex binding specificity using a combinatorial method. J. Cell. Biochem 21A:394, 1995.
3. Musso M, Thomas T, Shirhata A, Sigal LH, Van Dyke MW, Thomas TJ. Effects of chain length modification and bis(ethyl) substitution of tetra- and penta-amine analogs of spermine on triplex DNA stabilization, aggregation and conformational transitions. Biophys J 72:MAMD7, 1997.
4. Yennu-Nanda VG, Arora TS, Van Dyke MW. An herb extracted small molecule, VG0604a, upregulates p53 and p21/WAF1/Cip1 expression through proteasomal degradation of MDM2 and HDAC1. Proc Amer Assoc Cancer Res 47:2084, 4/2006.
5. Chanchorn E, Gopal YNV, Lee TR, Van Dyke MW. Comparisons between parthenolide and a new agent against acute myelogenous leukemia. Abstr Paper Am Chem Soc Natl Meet 235:MEDI 112, 4/2008.

Book Chapters
1. Van Dyke MW. Do DNA triple helices or quadruplexes have a role in transcription? In: DNA Conformation and Transcription. Springer, 105-126, 2005.
2. Van Dyke MW. Combinatorial Selection Methods. In: Encyclopedia of Cancer, 2nd Ed. Ed(s) Schwab M. Springer: Berlin, 731-735, 2008.

Manuals, Teaching Aids, Other Teaching Publications
1. Van Dyke MW. Interdisciplinary Studies in Cancer Biology Brochure. M. D. Anderson Cancer Center: Houston, USA, 8/1993.

EDITORIAL AND REVIEW ACTIVITIES

Editor/Service on Editorial Board(s)

Member, Gene Therapy and Molecular Biology, 1997-present

Journal Reviewer

Reviewer, Biochemistry, 1996 and subsequent years
Reviewer, Biomacromolecules, 1996 and subsequent years
Reviewer, Bioorganic and Medicinal Chemistry Letters, 1996 and subsequent years
Reviewer, Bioorganic and Medicinal Chemistry, 1996 and subsequent years
Reviewer, Bioorganic Chemistry, 1996 and subsequent years
Reviewer, Biophysics, 1996 and subsequent years
Reviewer, Biotechniques, 1996 and subsequent years
Reviewer, Cancer Chemotherapy and Pharmacology, 2009 and subsequent years
Reviewer, Cancer Letters, 2007 and subsequent years
Reviewer, Cancer Research, 1996 and subsequent years
Reviewer, Carcinogenesis, 2010
Reviewer, Cell Biochemistry Biophysics, 1996 and subsequent years
Reviewer, ChemBioChem, 1996 and subsequent years
Reviewer, Chemico-Biological Interactions, 1996 and subsequent years
Reviewer, Chemistry & Biology, 1996 and subsequent years
Reviewer, ChemMedChem, 2010 and subsequent years
Reviewer, Clinical Cancer Research, 1996 and subsequent years
Reviewer, Gene, 1996 and subsequent years
Reviewer, Genomics, 1996 and subsequent years
Reviewer, International Journal of Biological Macromolecules, 1996 and subsequent years
Reviewer, International Journal of Cancer, 2010 and subsequent years
Reviewer, Journal of Cell Biology, 1996 and subsequent years
Reviewer, Journal of Molecular Biology, 1996 and subsequent years
Reviewer, Journal of Molecular Diagnostics, 1996 and subsequent years
Reviewer, Journal of Physics A: Mathematical and Theoretical, 2010
Reviewer, Journal of the American Chemical Society, 1996 and subsequent years
Reviewer, Journal of Urology, 1996 and subsequent years
Reviewer, Molecular and Cellular Biology, 1996 and subsequent years
Reviewer, Molecular Biology Reports, 2007 and subsequent years
Reviewer, Molecular Cancer Therapeutics, 1996 and subsequent years
Reviewer, Molecular Carcinogenesis, 1993 and subsequent years
Reviewer, Nanotechnology, 1996 and subsequent years
Reviewer, Nucleic Acids Research, 1996 and subsequent years
Reviewer, Oncogene, 1996 and subsequent years
Reviewer, Oncology Research, 1996 and subsequent years

TEACHING

Teaching Within Present Institution – Western Carolina University

Formal Teaching

Courses Taught

1. Instructor, Survey of Chemistry I (80572) CHEM 132-03, 8/2010−12/2010.
   Credit hours: 4, contact hours: 3, student enrollment: 39
2. Instructor, Survey of Chemistry I (80574) CHEM 132-04, 8/2010−12/2010.
   Credit hours: 4, contact hours: 3, student enrollment: 57
3. Instructor, Survey of Chemistry II (81215) CHEM 133-01, 8/2010−12/2010.
   Credit hours: 4, contact hours: 3, student enrollment: 42
4. Coordinator, Survey of Chemistry II/LAB (81219) CHEM 133-30, 8/2010−12/2010.
   Credit hours: 0, contact hours: 0, student enrollment: 15
5. Coordinator, Survey of Chemistry II/LAB (81223) CHEM 133-31, 8/2010−12/2010.
   Credit hours: 0, contact hours: 0, student enrollment: 15
6. Coordinator, Survey of Chemistry II/LAB (82944) CHEM 133-32, 8/2010−12/2010.
   Credit hours: 0, contact hours: 0, student enrollment: 12

7. Instructor, Research in Chemistry (83138) CHEM 380-13, 8/2010−12/2010.
   Credit hours: 1, contact hours: 3, student enrollment: 1
8. Instructor, Principles of Biochemistry (12321) BIOL 361-01, 1/2011–5/2011.
   Credit hours: 3, contact hours: 3, student enrollment: 12
9. Instructor, Std: Biochemistry LAB (12327) BIOL 493-03, 1/2011–5/2011.
   Credit hours: 1, contact hours: 3, student enrollment: 1
10. Instructor, Std: Biochemistry LAB (12331) BIOL 593-01, 1/2011–5/2011.
    Credit hours: 1, contact hours: 3, student enrollment: 5
11. Instructor, Survey of Chemistry II (10473) CHEM 133-03, 1/2011–5/2011.
    Credit hours: 4, contact hours: 3, student enrollment: 58
12. Instructor, Principles of Biochemistry (12110) CHEM 361-01, 1/2011–5/2011.
    Credit hours: 3, contact hours: 3, student enrollment: 20
13. Instructor, Research in Chemistry (11666) CHEM 380-11, 1/2011–5/2011.
    Credit hours: 2, contact hours: 3, student enrollment: 2
14. Instructor, Std: Biochemistry LAB (11653) CHEM 493-01, 1/2011–5/2011.
    Credit hours: 1, contact hours: 3, student enrollment: 4
15. Instructor, Survey of Chemistry I (81295) CHEM 132-02, 8/2011−12/2011.
    Credit hours: 4, contact hours: 3, student enrollment: 49
16. Instructor, Survey of Chemistry I (81976) CHEM 132-06, 8/2011−12/2011.
    Credit hours: 4, contact hours: 3, student enrollment: 65
17. Instructor, Survey of Chemistry II (81301) CHEM 133-01, 8/2011−12/2011.
    Credit hours: 4, contact hours: 3, student enrollment: 50
18. Coordinator, Survey of Chemistry II/LAB (82129) CHEM 133-30, 8/2011−12/2011.
    Credit hours: 0, contact hours: 0, student enrollment: 22
19. Coordinator, Survey of Chemistry II/LAB (82142) CHEM 133-32, 8/2011−12/2011.
    Credit hours: 0, contact hours: 0, student enrollment: 22
20. Instructor, Research in Chemistry (82503) CHEM 380-13, 8/2011−12/2011.
    Credit hours: 2, contact hours: 6, student enrollment: 1
21. Instructor, Research in Chemistry (82728) CHEM 380-15, 8/2011−12/2011.
    Credit hours: 3, contact hours: 9, student enrollment: 1

Supervisory Teaching

Committees

Graduate Committees

1. Member, Graduate Committee, WCU, Daniel Nolan, 4/2011−present

Direct Supervision

Undergraduate Students

1. Catherine Denning, 8/2010−present
2. Jeremiah Bell, 1/2011–5/2011
3. Kirsten Collins, 8/2011–present

Graduate Students

1. James “Ryan” Simmons, 1/2011−5/2011
2. Sallie “Katie” Lewis-Sheasby, 1/2011–3/2011

Academic Advising

Undergraduate Students

1. Anna Hovis, 8/2011−present
2. Qiannan Huang, 8/2011–present
3. Kelsey Sharpe, 8/2011–present
4. Zachary Slotterback, 8/2011–present
5. Ronald Westbrook, 8/2011–present

Teaching Within Former Institutions - The University of Texas M. D. Anderson Cancer Center

Formal Teaching

Courses Taught

1. Instructor, Tutorial Research Experience (GS000514), UT–Houston Graduate School of Biomedical Sciences, 1/1989−5/2008
2. Instructor, Research in Biomedical Sciences (GS000520), UT–Houston Graduate School of Biomedical Sciences, 6/1991−5/2010
3. Instructor, Eukaryotic Gene Expression (GS040123), UT–Houston Graduate School of Biomedical Sciences, 2/1993−2/1996
4. Instructor, Metabolic Biochemistry (GS030014), UT–Houston Graduate School of Biomedical Sciences, 1/1994
5. Instructor, Immunology I (GS040801), UT–Houston Graduate School of Biomedical Sciences, 10/1994−11/2001
6. Instructor, Dissertation for Doctor of Philosophy (GS000920), UT–Houston Graduate School of Biomedical Sciences, 6/1995−5/2002
7. Coordinator and Instructor, Succeeding in Science (GS210101), UT–Houston Graduate School of Biomedical Sciences, 1/1997−7/2009
   Credit hours: 1, contact hours: 1, average student enrollment: 12
8. Coordinator and Instructor, Cancer Cell Signaling (GS040133), UT–Houston Graduate School of Biomedical Sciences, 1/2010−5/2010.
   Credit hours: 3, contact hours: 3, student enrollment: 51

Training Programs

1. Faculty, Cancer Biology Program, UT–Houston Graduate School of Biomedical Sciences, 9/1990−8/2010
2. Faculty, NCI Training Grant T32 (CA60440), UTMDACC, 7/1993−6/2003
3. Affiliated Faculty, BCRP Training Grant (BC980940), UTMDACC, 9/1999−8/2001

Supervisory Teaching

Committees

Advisory Committees

1. Member, Thesis Advisory Committee, GSBS, Jon Scales, 6/1989−7/1991
2. Member, Thesis Advisory Committee, GSBS, Dean Reardon, 6/1989−8/1991
3. Member, Thesis Advisory Committee, GSBS, Doris (Kaneshiro) Siwak, 9/1990−2/1994
4. Member, Thesis Advisory Committee, GSBS, Jeff Touchman, 4/1991−12/1992
5. Chair, Thesis Advisory Committee, GSBS, Chuan Gao, 7/1991−1/1993
6. Member, Thesis Advisory Committee, GSBS, Carmin Marin, 7/1991−2/1993
7. Member, Thesis Advisory Committee, GSBS, Caroline Heckman, 7/1991−4/1994
8. Member, Thesis Advisory Committee, GSBS, Satrajit Sinha, 7/1991−7/1994
9. Member, Thesis Advisory Committee, GSBS, Laura Angelo, 8/1991−11/1995
10. Member, Thesis Advisory Committee, GSBS, Robin Stalcup, 10/1991−4/1993
11. Member, Thesis Advisory Committee, GSBS, Mee-wa Wong, 2/1992−8/1993
12. Member, Thesis Advisory Committee, GSBS, Kevin Casement, 4/1992−11/1994
13. Chair, Thesis Advisory Committee, GSBS, Paul Hardenbol, 5/1992−2/1995
14. Chair, Thesis Advisory Committee, GSBS, Ann-Joy Cheng, 6/1992−7/1994
15. Member, Thesis Advisory Committee, GSBS, Tim Ritty, 9/1992−8/1995
16. Member, Thesis Advisory Committee, GSBS, Xue-qun Hua, 10/1992−5/1993
17. Member, Thesis Advisory Committee, GSBS, Geng Liu, 10/1992−12/1995
18. Member, Thesis Advisory Committee, GSBS, Qing Lin, 3/1993−12/1995
19. Member, Thesis Advisory Committee, GSBS, Xiaoli Shirley Li, 6/1993−9/1994
20. Member, Thesis Advisory Committee, GSBS, Sean Hanson, 6/1993−1/1995
21. Member, Thesis Advisory Committee, GSBS, Ruth-Anne Pimental, 7/1993−6/1995
22. Member, Thesis Advisory Committee, GSBS, Zhengping Xu, 7/1993−2/1996
23. Member, Thesis Advisory Committee, GSBS, Song Chu Ko, 9/1993−3/1997
24. Member, Thesis Advisory Committee, GSBS, Quinn Kleerekoper, 1/1994−4/1996

25. Member, Thesis Advisory Committee, GSBS, Michael (Wen-Jun) Wang, 7/1994−6/1996
26. Member, Thesis Advisory Committee, GSBS, Darren Woodside, 10/1994−4/1996
27. Member, Thesis Advisory Committee, GSBS, Yongsheng Ren, 2/1995−10/1996
28. Member, Thesis Advisory Committee, GSBS, Mollianne McGahren, 10/1995−2/1998
29. Member, Thesis Advisory Committee, GSBS, Jun Yao, 2/1996−3/1999
30. Member, Thesis Advisory Committee, GSBS, Shiaw-Yih Lin, 10/1996−1/1999
31. Chair, Thesis Advisory Committee, GSBS, Gulshan Sunavala, 1/1997−4/1999
32. Chair, Thesis Advisory Committee, GSBS, Song Chu Ko, 3/1997−6/1998
33. Member, Thesis Advisory Committee, GSBS, Tong Jing, 9/1997−8/1999
34. Member, Thesis Advisory Committee, GSBS, Irving Pass, 11/1997−5/2000
35. Chair, Thesis Advisory Committee, GSBS, Laura Nelson, 2/1998−9/1999
36. Member, Thesis Advisory Committee, GSBS, Matthew Rands, 4/1998−1/1999
37. Member, Thesis Advisory Committee, GSBS, Bryan Poe, 3/1999−8/2001
38. Member, Thesis Advisory Committee, GSBS, Jennifer Givens, 9/1999−12/2000
39. Member, Thesis Advisory Committee, GSBS, Chi-Hui Tang, 3/2000−10/2002
40. Member, Thesis Advisory Committee, GSBS, Meghan Minard, 6/2000−9/2001
41. Member, Thesis Advisory Committee, GSBS, Robert Meade, 7/2000−10/2002
42. Member, Thesis Advisory Committee, GSBS, Shoubin Wen, 9/2000−4/2002
43. Member, Thesis Advisory Committee, GSBS, Yan Li, 1/2001−7/2003
44. Member, Thesis Advisory Committee, GSBS, Chi-Ping Day, 8/2001−7/2003
45. Acting Chair, Thesis Advisory Committee, GSBS, Bryan Poe, 9/2001−6/2002
46. Member, Thesis Advisory Committee, GSBS, John Mumm, 9/2001−11/2003
47. Member, Thesis Advisory Committee, GSBS, Shankavaram Deepti Srinivas Wilkinson, 12/2001−11/2003
48. Member, Thesis Advisory Committee, GSBS, Mollianne McGahren, 2/2002−4/2004
49. Member, Thesis Advisory Committee, GSBS, Shankar Sellappan, 4/2002−1/2004
50. Member, Thesis Advisory Committee, GSBS, Tai-Lung Cha, 10/2002−7/2004
51. Member, Thesis Advisory Committee, GSBS, Jennifer Frey, 3/2003−12/2005
52. Member, Thesis Advisory Committee, GSBS, Rong Luo, 5/2003−11/2005
53. Member, Thesis Advisory Committee, GSBS, Himanshu Bhatia, 7/2003−12/2005
54. Member, Thesis Advisory Committee, GSBS, Chao-Kai Chou, 10/2004−2/2007
55. Member, Thesis Advisory Committee, GSBS, Xiaoyun Cheng, 12/2004−8/2007
56. Member, Thesis Advisory Committee, GSBS, Qiang Li, 8/2005−6/2006
57. Member, Thesis Advisory Committee, GSBS, Hsu-Ping Kuo, 11/2005−10/2007
58. Member, Thesis Advisory Committee, GSBS, Cheng-Chieh Yang, 12/2005−5/2008
59. Member, Thesis Advisory Committee, GSBS, Hsin-Hsien Yeh, 11/2006−1/2007
60. Member, Thesis Advisory Committee, GSBS, Hui Song, 11/2006−9/2008
61. Member, Thesis Advisory Committee, GSBS, Yi Du, 11/2006−1/2009
62. Member, Thesis Advisory Committee, University of Houston, Ekkawit Chanchorn, MD, 6/2007−4/2008
63. Member, Thesis Advisory Committee, GSBS, Chun-Te Chen, 7/2007−5/2009
64. Member, Thesis Advisory Committee, GSBS, Song Yi Ko, 7/2007−8/2009
65. Chair, Thesis Advisory Committee, GSBS, Brian Pickering, 8/2007−1/2010
66. Member, Thesis Advisory Committee, GSBS, Mo Liu, 10/2007−5/2009
67. Member, Thesis Advisory Committee, GSBS, Huijuan Song, 6/2008−8/2010
68. Member, Thesis Advisory Committee, GSBS, Ping-Chieh Chou, 8/2008−1/2010
69. Member, Thesis Advisory Committee, GSBS, Matthew White, 9/2008−1/2010
70. Member, Thesis Advisory Committee, GSBS, Sumaiyah Rehman, 10/2008−1/2010
71. Member, Thesis Advisory Committee, GSBS, Heng-Huan Lee, 11/2008−8/2010
72. Member, Thesis Advisory Committee, GSBS, Hong-Jen Lee, 11/2008−8/2010
73. Member, Thesis Advisory Committee, GSBS, Jia Shen, 11/2008−8/2010

74. Member, Thesis Advisory Committee, GSBS, Hsin-Wei Liao, 11/2009−8/2010

Supervisory Committees

1. Member, Thesis Supervisory Committee, GSBS, Ting-Chung Suen, 6/1989−12/1990
2. Member, Thesis Supervisory Committee, GSBS, Xiaoyan Zhao, 10/1990−5/1992
3. Member, Thesis Supervisory Committee, GSBS, Lydia Bishop, 3/1991−3/1994
4. Member, Thesis Supervisory Committee, GSBS, Jon Scales, 7/1991−12/1993
5. Member, Thesis Supervisory Committee, GSBS, Guangquan Zhao, 2/1992−8/1993
6. Member, Thesis Supervisory Committee, Baylor College of Medicine, Shi Li, 6/1992−7/1994
7. Member, Thesis Supervisory Committee, GSBS, Susan Miller, 9/1992−8/1994
8. Member, Thesis Supervisory Committee, GSBS, Jeffrey Touchman, 12/1992−8/1994
9. Member, Thesis Supervisory Committee, GSBS, Diana Hulboy, 3/1993−8/1995
10. Member, Thesis Supervisory Committee, GSBS, Laura Whitaker, 12/1993−12/1995
11. Member, Thesis Supervisory Committee, GSBS, Doris Siwak, 2/1994−5/1998
12. Member, Thesis Supervisory Committee, GSBS, Jerry Ainsworth, 4/1994−7/1995
13. Member, Thesis Supervisory Committee, GSBS, Caroline Heckman, 4/1994−5/1996
14. Member, Thesis Supervisory Committee, GSBS, Sybil Santee, 4/1994−5/1996
15. Member, Thesis Supervisory Committee, GSBS, Satrajit Sinha, 7/1994−8/1995
16. Chair, Thesis Supervisory Committee, GSBS, Ann-Joy Cheng, 7/1994−11/1995
17. Member, Thesis Supervisory Committee, GSBS, Chuan Gao, 7/1994−12/1995
18. Member, Thesis Supervisory Committee, GSBS, Xiaoli Shirley Li, 9/1994−1/1995
19. Member, Thesis Supervisory Committee, GSBS, Lesah Doerksen, 12/1994−12/1995
20. Member, Thesis Supervisory Committee, GSBS, Shouchun Liu, 2/1995−12/1995
21. Member, Thesis Supervisory Committee, GSBS, Zhong Yun, 2/1995−5/1996
22. Chair, Thesis Supervisory Committee, GSBS, Paul Hardenbol, 2/1995−8/1996
23. Member, Thesis Supervisory Committee, GSBS, Ruth-Anne Pimental, 6/1995−8/1996
24. Member, Thesis Supervisory Committee, GSBS, Tim Ritty, 8/1995−5/1996
25. Member, Thesis Supervisory Committee, GSBS, David Wooten, 4/1996−12/1998
26. Acting Chair, Thesis Supervisory Committee, GSBS, Wen-Jung (Michael) Wang, 8/1996−12/1996
27. Member, Thesis Supervisory Committee, GSBS, Andrea Crabtree, 11/1996−8/1999
28. Member, Thesis Supervisory Committee, GSBS, Henry Chan, 12/1996−5/1999
29. Member, Thesis Supervisory Committee, Tong Sun, 6/1997−12/1999
30. Member, Thesis Supervisory Committee, The University of Texas School of Public Health, Xiaohong Yang, 6/1997−7/1999
31. Member, Thesis Supervisory Committee, GSBS, Eva Caudell, 11/1997−12/1999
32. Chair, Thesis Supervisory Committee, GSBS, Mollianne McGahren, 2/1998−12/2000
33. Chair, Thesis Supervisory Committee, GSBS, Song Chu Ko, 6/1998−8/1998
34. Member, Thesis Supervisory Committee, GSBS, Heike Allgayer, 6/1998−5/1999
35. Member, Thesis Supervisory Committee, GSBS, Eunice Laurent, 9/1998−12/2001
36. Member, Thesis Supervisory Committee, GSBS, Matthew T. Rands, 1/1999−9/1999
37. Chair, Thesis Supervisory Committee, GSBS, Gulshan Sunavala, 4/1999−5/2000
38. Member, Thesis Supervisory Committee, GSBS, Deana Leonard, 4/1999−8/2002
39. Chair, Thesis Supervisory Committee, GSBS, Laura Nelson, 9/1999−5/2002

40. Member, Thesis Supervisory Committee, GSBS, Jennifer Givens, 12/2000−8/2001
41. Member, Thesis Supervisory Committee, GSBS, Sangeeta Cheema, 3/2001−12/2002
42. Member, Thesis Supervisory Committee, GSBS, Meghan Minard, 9/2001−12/2001
43. Member, Thesis Supervisory Committee, GSBS, Christopher Neal, 9/2001−5/2004
44. Member, Thesis Supervisory Committee, GSBS, Zhenming Yu, 1/2002−5/2003
45. Member, Thesis Supervisory Committee, GSBS, Shoubin Wen, 4/2002−12/2002
46. Acting Chair, Thesis Supervisory Committee, GSBS, Bryan Poe, 6/2002−6/2005
47. Chair, Thesis Supervisory Committee, GSBS, Chi-Hui Tang, 10/2002−12/2003
48. Member, Thesis Supervisory Committee, GSBS, Stephanie Miller, 11/2002−8/2003
49. Member, Thesis Supervisory Committee, GSBS, Junlin Qi, 11/2002−5/2006
50. Member, Thesis Supervisory Committee, GSBS, Yan Li, 7/2003−5/2004
51. Member, Thesis Supervisory Committee, GSBS, Sangjun Lee, 11/2003−8/2004
52. Member, Thesis Supervisory Committee, GSBS, John Mumm, 11/2003−8/2005
53. Chair, Thesis Supervisory Committee, GSBS, Shankar Sellappan, 1/2004−10/2004
54. Member, Thesis Supervisory Committee, GSBS, Mollianne Murray, 4/2004−5/2007
55. Member, Thesis Supervisory Committee, GSBS, Tai-Lung Cha, 7/2004−8/2005
56. Member, Thesis Supervisory Committee, GSBS, Rong Luo, 11/2005−12/2007
57. Member, Thesis Supervisory Committee, GSBS, Himanshu Bhatia, 12/2005−5/2006
58. Member, Thesis Supervisory Committee, GSBS, Dung-Fang Lee, 3/2006−5/2008
59. Member, Thesis Supervisory Committee, GSBS, Chao-Kai Chou, 2/2007−8/2009
60. Member, Thesis Supervisory Committee, GSBS, Xiaoyun Cheng, 8/2007−8/2009
61. Member, Thesis Supervisory Committee, GSBS, Jer-Yen Yang, 10/2007−4/2009
62. Member, Thesis Supervisory Committee, GSBS, Hsu-Ping Kuo, 10/2007−7/2009
63. Member, Thesis Supervisory Committee, GSBS, Jung-Mao Hsu, 3/2008−8/2010
64. Member, Thesis Supervisory Committee, GSBS, Cheng-Chieh Yang, 5/2008−11/2009
65. Member, Thesis Supervisory Committee, University of Houston, Ekkawit Chanchorn, MD, 6/2008−present
66. Member, Thesis Supervisory Committee, GSBS, Emily Jen, 8/2008−8/2010
67. Member, Thesis Supervisory Committee, GSBS, Hui Song, 9/2008−8/2010
68. Member, Thesis Supervisory Committee, GSBS, Yi Du, 4/2009−8/2010
69. Member, Thesis Supervisory Committee, GSBS, Chun Te Chen, 11/2009−8/2010
70. Member, Thesis Supervisory Committee, GSBS, Mo Liu, 11/2009−8/2010
71. Member, Thesis Supervisory Committee, GSBS, Rhys Adams, 11/2009−12/2009

Examining Committees

1. Member, Examining Committee, GSBS, Thomas Brennan, 7/1989
2. Member, Examining Committee, GSBS, Craig Hinkley, 8/1989
3. Member, Examining Committee, GSBS, Diane Edmondson, 1/1990
4. Member, Examining Committee, GSBS, Lydia Bishop, 11/1990
5. Member, Examining Committee, GSBS, Jon Scales, 5/1991
6. Member, Examining Committee, GSBS, Rong-Lang Yen, 12/1991
7. Member, Examining Committee, GSBS, Siew-Ging Gong, 1/1992
8. Member, Examining Committee, GSBS, Tse-Chang Cheng, 1/1992
9. Member, Examining Committee, Baylor College of Medicine, Shi Li, 1/1992
10. Member, Examining Committee, GSBS, Diana Hulboy, 9/1992
11. Member, Examining Committee, GSBS, Jeffrey Touchman, 9/1992

12. Member, Examining Committee, GSBS, Jumin Zhou, 11/1992
13. Member, Examining Committee, GSBS, Caroline Heckman, 3/1993
14. Member, Examining Committee, GSBS, Mee-Wa Wong, 6/1993
15. Member, Examining Committee, GSBS, Jerry Ainsworth, 8/1993
16. Member, Examining Committee, GSBS, Xu Luo, 9/1993
17. Member, Examining Committee, GSBS, Doris Siwak, 10/1993
18. Member, Examining Committee, GSBS, Satrajit Sinha, 1/1994
19. Member, Examining Committee, GSBS, Zhong Yun, 9/1994
20. Member, Examining Committee, GSBS, Timothy Ritty, 12/1994
21. Member, Examining Committee, GSBS, Mary Gilbreth, 3/1995
22. Member, Examining Committee, GSBS, Geng Liu, 12/1995
23. Chair, Examining Committee, GSBS, Wen-Jung (Michael) Wang, 2/1996
24. Member, Examining Committee, GSBS, Mona Sarkiss, 8/1996
25. Member, Examining Committee, GSBS, Eva Caudell, 9/1997
26. Member, Examining Committee, GSBS, Song Ko, 10/1997
27. Member, Examining Committee, GSBS, Eunice Laurent, 2/1998
28. Member, Examining Committee, GSBS, Jack Chen, 4/1998
29. Member, Examining Committee, GSBS, Shiaw-Yih Lin, 6/1998
30. Member, Examining Committee, GSBS, Deana Leonard, 7/1998
31. Member, Examining Committee, GSBS, Heike Allgayer, 9/1998
32. Member, Examining Committee, GSBS, Song Cho, 3/1999
33. Member, Examining Committee, GSBS, Sangeeta Cheema, 5/2000
34. Member, Examining Committee, GSBS, Randall Evans, 8/2000
35. Member, Examining Committee, GSBS, Zhenming Yu, 9/2001
36. Member, Examining Committee, GSBS, Bryan Poe, 12/2001
37. Chair, Examining Committee, GSBS, Chi-Hui Tang, 12/2001
38. Member, Examining Committee, GSBS, Sanjun Lee, 2/2002
39. Member, Examining Committee, GSBS, Yan Li, 2/2002
40. Member, Examining Committee, GSBS, Stephanie Miller, 3/2002
41. Member, Examining Committee, GSBS, John Mumm, 6/2002
42. Chair, Examining Committee, GSBS, Shankar Sellappan, 12/2002
43. Member, Examining Committee, GSBS, Meghan Minard, 1/2003
44. Member, Examining Committee, GSBS, Tai-Lung Cha, 7/2003
45. Member, Examining Committee, GSBS, Molianne Murray, 10/2003
46. Member, Examining Committee, GSBS, Rong Luo, 12/2004
47. Member, Examining Committee, GSBS, Jennifer Frey, 2/2005
48. Member, Examining Committee, GSBS, Dung-Fang Lee, 4/2005
49. Member, Examining Committee, GSBS, Lei Guo, 9/2005
50. Member, Examining Committee, GSBS, Xiaoyun Cheng, 10/2005
51. Member, Examining Committee, GSBS, Qiang Li, 12/2005
52. Member, Examining Committee, GSBS, Haoyi Chen, 7/2006
53. Chair, Examining Committee, GSBS, Chao-Kai Chou, 9/2006
54. Member, Examining Committee, GSBS, Jer-Yen Yang, 11/2006
55. Member, Examining Committee, GSBS, Hsu-Ping Kuo, 12/2006
56. Member, Examining Committee, GSBS, Cheng-Chieh Yang, 4/2007
57. Member, Examining Committee, GSBS, Cheng-Yu Tsai, 4/2007
58. Member, Examining Committee, GSBS, Jung-Mao Hsu, 4/2007
59. Member, Examining Committee, GSBS, Emily Jen, 11/2007
60. Member, Examining Committee, GSBS, Hui Song, 1/2008
61. Member, Examining Committee, University of Houston, Ekkawit Chanchorn, MD, 5/2008
62. Member, Examining Committee, GSBS, Yi Du, 9/2008
63. Member, Examining Committee, GSBS, Song Yi Ko, 10/2008
64. Member, Examining Committee, GSBS, Chun-Te Chen, 12/2008
65. Member, Examining Committee, GSBS, Mo Liu, 1/2009
66. Member, Examining Committee, GSBS, Huijuan Song, 5/2009

67. Member, Examining Committee, GSBS, Guermarie Velazquez Torres, 6/2009
68. Member, Examining Committee, GSBS, Sumaiyah Rehman, 7/2009
69. Member, Examining Committee, GSBS, Chien-Hung Chen, 10/2009

Direct Supervision

Undergraduate and Allied Health Students

1. Matthew Gretzer, 6/1990−8/1990
2. Julie Hoffman, 6/1991−8/1991
3. Christine Hoover, 6/1996−7/1996
4. Jing Shen, 6/1996−8/1996, 6/1997−8/1997
5. Michael Stephen, 6/1999−8/1999
6. Cherice Anderson, 6/2003−8/2003
7. Jared Holtgrave, 6/2007−8/2007
8. Moiz Siddiqui, 11/2007−4/2008
9. Sivakumar Sudhakaran, 6/2009−7/2009

Graduate Students

1. Tres Camacho, GSBS, 3/1989−5/1989
2. Alberto Fernandez-Medarde, University of Leon, Spain, 7/1990−8/1990, 1/1992−7/1992
3. Joel M. Grice, GSBS, 9/1990−10/1990
4. Chuan Gao, GSBS, 1/1991−3/1991,6/1991−8/1992
5. Alex Sandoval, GSBS, 3/1991−5/1991
6. Kevin Casement, GSBS, 7/1991−8/1991
7. Ann-Joy Cheng, GSBS, 9/1991−11/1991, 6/1992−11/1995 (PhD, GSBS, 1996, Biomedical Sciences)
8. Timothy Ritty, GSBS, 9/1991−11/1991
9. Edward Klebanow, DVM, GSBS, 1/1992−3/1992
10. Paul Hardenbol, GSBS, 5/1992−8/1996 (PhD, GSBS, 1997, Biomedical Sciences)
11. Bin Zhao, GSBS, 9/1992−11/1992
12. Quinn K. Kleerekoper, GSBS, 9/1992−11/1992
13. Jaime A. Rivera, GSBS, 1/1993−3/1993
14. John F. Kroepfl, GSBS, 1/1993−3/1993
15. Lisa S. St. John, GSBS, 9/1993−11/1993
16. Axel Imhof, University of Regensburg, Germany, 9/1994−11/1994
17. Gulshan Sunavala, DDS, GSBS, 12/1996−4/2000 (PhD, GSBS, 2000, Biomedical Sciences)
18. Xiaohong Yang, The University of Texas School of Public Health, 6/1997−7/1999 (MS, UT-SPH, 2000, Epidemiology)
19. Laura D. Nelson, GSBS, 6/1997−5/2002 (PhD, GSBS, 2002, Biomedical Sciences)
20. Byong (Calvin) S. Kim, GSBS, 9/1997−12/1997
21. Chi-Hui Tang, GSBS, 1/1999−3/1999
22. Raegan D'Ann Hunt, GSBS, 7/1999−10/1999
23. Chad W. Belton, GSBS, 6/2000−12/2000, 8/2001−12/2001
24. Tarandeep Singh Arora, The University of Texas School of Public Health, 9/2002−5/2006
25. Jui-Chuan Tseng, GSBS, 8/2003−10/2003
26. Murtuza M. Rampurwala, The University of Texas School of Public Health, 12/2006−10/2007
27. Geeta Savla, The University of Texas School of Public Health, 1/2007−2/2007
28. Brian Pickering, PhD, GSBS, 1/2007−3/2007, 6/2007−1/2010
29. Ekkawit Chanchorn, MD, University of Houston, 6/2007−8/2010
30. Matthew White, GSBS, 9/2007−12/2007
31. Huijuan Song, GSBS, 12/2007−3/2008

Postdoctoral Research Fellows

1. Raghava H.R. Reddy, Ph.D., 9/1991−8/1992
2. Elizabeth R. Andrews, Ph.D., 6/1993−6/1994
3. Marco Musso, Ph.D., 1/1994−6/1997
4. Vashisht G. Yennu Nanda, Ph.D., 3/2000−2/2005
5. Dakshesh Mehta, Ph.D., 11/2000−6/2003
6. Rodney G. Weilbaecher, Ph.D., 9/2001−9/2004
7. Johnson Baby, Ph.D., 7/2003−9/2004

Other Direct Supervision

1. YN Vashisht Gopal, PhD, Instructor, 3/2005−8/2008
2. Orawan Khantamat, Visiting Scientist, 9/2008−2/2009
3. Sukanya Yandrawatthana, MD, Visiting Scientist, 4/2009−5/2009

Other Supervisory Teaching

Patrick Zweidler-McKay, MD, PhD, Assistant Professor, 5/2008−8/2009, Mentor

Other Educational Contributions

1. Annual Research Retreat Panelist, The University of Texas - Austin, School of Pharmacy, Port Aransas, TX, 10/1997−10/1998
2. Interest Area Advisor, The University of Texas Graduate School of Biomedical Sciences, Cancer Biology Program, Houston, TX, 9/1998−8/1999
3. Area Reviewer, The University of Texas Graduate School of Biomedical Sciences, Cancer Biology Program, Houston, TX, 9/1998−8/2001
4. Judge Panelist, The University of Texas M. D. Anderson Cancer Center, Trainee & Alumni Affairs, Houston, TX, 4/2002−5/2004
5. Common Exchange Panelist, The University of Texas M. D. Anderson Cancer Center, Trainee & Alumni Affairs, Houston, TX, 4/2005−8/2010
6. Judge Panelist, 51st National Student Research Forum, The University of Texas Medical Branch, Galveston, TX, 4/2010

CONFERENCES AND SYMPOSIA

Organization of Conferences/Symposia (Include chairing session)

1. UT M.D. Anderson Cancer Center, Symposium on Fundamental Cancer Research, Houston, TX, Session Chairman, 10/1993
2. Cancer Therapy, International Conferences on Gene Therapy and Molecular Biology and Medicine, Redwood City, CA, Session Chairman, 4/1999
3. Cancer Therapy, 8th International Conference on Gene and Drug Therapy, Hersonissos, Crete, Greece, Session Chairman, 9/2005

Presentations at National or International Conferences

Invited

1. Analysis of Domains within the Human General Transcription Factor TFIID Required for Specific Transcription Initiation, Cancer Cells, Regulation of Eukaryotic mRNA Transcription, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 9/1989
2. The Initiator Element Directs the Downstream Promoter Interaction of TFIID, Keystone Symposium, Fundamental Mechanisms of Transcription, Keystone, CO, 3/1992
3. Mediation of Transcription Stimulation by USF and Sp1 through TFIID-Initiator Interactions, Keystone Symposium, Transcription: Factors, Regulation and Differentiation, Keystone, CO, 1/1993
4. Formation of Parallel-stranded Duplex DNAs with G/T-rich Oligodeoxyribonucleotides, Recognition Studies in Nucleic Acids - III (NACON III), University of Sheffield, Sheffield, United Kingdom, 4/1995

5. Inhibition of Transcription Elongation in vivo by Repair-resistant, Purine-motif Triplex-forming Oligonucleotides, Therapeutic Oligonucleotides: From Cell to Man, Chateau de Seillac, France, 4/1995
6. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, International Conference on Cancer Drug Discovery: Gene Expression as a Drug Target, Killarney, Ireland, 9/1996
7. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, 53rd American Chemical Society Southwest Regional Meeting, Houston, TX, 10/1996
8. REPSA: A Universal Combinatorial Method for Determining Ligand-DNA Binding Sequences, International Conference on Gene Therapy and Molecular Biology, Agia Pelagia, Greece, 8/1997
9. REPSA, A General Combinatorial Method for Identifying Consensus Ligand-DNA Binding Sequences, Recognition Studies in Nucleic Acids - IV (NACON IV), University of Sheffield, Sheffield, United Kingdom, 4/1998
10. Characterization of Purine-Motif Triplex-Binding Proteins, International Conference on Gene Therapy and Molecular Biology, Agia Pelagia, Greece, 8/1998
11. REPSA, A General Combinatorial Method for Identifying Consensus Ligand-DNA Binding Sequences, 54th American Chemical Society Southwest Regional Meeting, Baton Rouge, LA, 11/1998
12. Purine-Motif Triple-Helical DNA-Binding Proteins, International Conferences on Gene Therapy and Molecular Biology and Medicine, Redwood City, CA, 4/1999
13. G*G Multiplex DNA-Binding Proteins, Recognition Studies in Nucleic Acids - V (NACON V), University of Sheffield, Sheffield, United Kingdom, 4/2001
14. Identification of Polyamide-DNA Preferred Binding Sites by the Combinatorial Method REPSA, 58th American Chemical Society Southwest Regional Meeting, Austin, TX, 11/2002
15. Combinatorial Identification of a Novel Consensus Sequence for the Covalent DNA-Binding Polyamide Tallimustine, 229th American Chemical Society National Meeting and Exposition, San Diego, CA, 3/2005
16. The S. cerevisiae Protein Stm1p Facilitates Ribosomal Subunit Assembly, 10th Annual RNA Society Conference, Banff, Canada, 5/2005
17. Abolition of Specific Histone Deacetylases by Activated Nuclear Factor-kappaB in Breast Cancer Cells, 4th Era of Hope Department of Defense Breast Cancer Research Program Meeting, Philadelphia, PA, 6/2005
18. Abolition of Specific Histone Deacetylases by Activated Nuclear Factor-kappaB in Breast Cancer Cells, 8th International Conference on Gene and Drug Therapy, Hersonissos, Greece, 9/2005
19. The Stm1 protein is a new Member of the TOR Signaling Pathway in S. cerevisiae, Translational Control, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 9/2006
20. Parthenolide Specifically Depletes Histone Deacetylase 1 Protein and Induces Cell Death through Ataxia Telangiectasia Mutated, FASEB Summer Research Conference - Histone Deacetylases, Snowmass Village, CO, 6/2007
21. Parthenolide, a Polymachic Anticancer Agent, Depletes HDAC1 and MDM2 and Activates p53 and p21 in Breast Cancer Cells, Era of Hope Department of Defense Breast Cancer Research Program Meeting, Baltimore, MD, 6/2008
22. STM1 Affects Translation by Altering the Ribosome Association of Elongation Factor 3, Translational Control, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 9/2008
23. Modulation of Multiple Oncoproteins and Tumor Suppressors by the Bioactive Small Molecule Parthenolide - Controlling the Cancer Machine, 64th Southwest Regional American Chemical Society Meeting, American Chemical Society, Little Rock, AR, 10/2008

Other, Including Scientific Exhibitions

1. Khantamat O, Van Dyke M. Structure-activity relationships among sesquiterpene lactones, polymachic natural product anticancer agents, 2nd Biochemistry & Molecular Biology Conference, The Science Society of Thailand, Khon Kaen, Thailand, 5/7/2009

Seminar Invitations from Other Institutions

1. Triplexes and Transcription, Veterans Affairs Medical Center, Houston, TX, 2/1994
2. A Combinatorial Search of Triplex Space, Baylor University, Waco, TX, 10/1995
3. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, Sigma Biosciences, St. Louis, MO, 9/1996
4. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, UT-Austin School of Pharmacy, Austin, TX, 5/1998
5. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, GeneSoft, Inc., South San Francisco, CA, 4/1999
6. A Combinatorial Search of Ligand-DNA Space, Houston Baptist University, Houston, TX, 10/1999
7. Purine-Motif Triple-Helical DNA-Binding Proteins, University of Southern Mississippi, Hattiesburg, MS, 3/2000
8. Purine-Motif Triple-Helical DNA-Binding Proteins, Baylor College of Medicine, Houston, TX, 5/2000
9. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, Randolph-Macon College, Ashland, VA, 11/2000
10. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, Southwest Texas State University, San Marcos, TX, 12/2000
11. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, GeneSoft, Inc., South San Francisco, CA, 1/2001
12. REPSA: A General Combinatorial Approach for Determining Ligand-DNA Binding Specificities, Florida International University, Miami, FL, 2/2001
13. REPSA: A Combinatorial Solution for DNA-Binding Specificity, Howard-Payne University, Brownwood, TX, 1/2003
14. Depletion of Specific Histone Deacetylases by Activated NF-kappaB in Breast Cancer Cells, Louisiana State University Health Sciences Center, Shreveport, LA, 9/2005
15. Parthenolide: Discovery of a Polymachic Anticancer Agent, Baylor University, Waco, TX, 2/2008
16. Parthenolide: Discovery of a Polymachic Anticancer Agent, Thomas M. Teague Biotechnology Center, Fairfield, ME, 7/2008
17. Parthenolide: Discovery of a Polymachic Anticancer Agent, Texas Womans University, Denton, TX, 9/2008
18. Parthenolide: Discovery of a Polymachic Anticancer Agent, University of Arkansas for Medical Sciences, School of Pharmacy, Little Rock, AR, 2/2009
19. REPSA: DNA Binding Specificity Made Simple, Western Carolina University, Cullowhee, NC, 3/2010
20. REPSA: DNA Binding Specificity Made Simple, Texas A&M University – Corpus Christi, Corpus Christi, TX, 3/2010
21. REPSA: DNA Binding Specificity Made Simple, Montana Tech of the University of Montana, Butte, MT 4/2010
22. REPSA: DNA Binding Specificity Made Simple, University of North Carolina – Charlotte, Charlotte, NC 10/2011

Other Presentations at State and Local Conferences

1. Vashisht Gopal YN, Arora T, Van Dyke MW. Specific pharmacological inhibition of histone deacetylase 1 through modulation of biological pathways, JS Dunn Gulf Coast Consortia Epigenome Workshop, Houston, TX, 5/2009

PROFESSIONAL MEMBERSHIPS/ACTIVITIES

Professional Society Activities, with Offices Held

National and International

American Society for Microbiology, Member, 1989−1995
American Chemical Society, Member, 1993−present

DATE OF LAST CV UPDATE 19Oct2011

D.5 Departmental Collegial Review Document

Department of Chemistry & Physics
Collegial Review Document
Effective Fall, 2010

Policies, Procedures, and Criteria for Faculty Evaluation:
Annual Faculty Evaluation, Reappointment, Tenure, Promotion and Post-Tenure Review

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I. Overview

The purpose of this document is to describe the policies, procedures, and criteria for faculty performance evaluation in the Department of Chemistry & Physics. The document is guided at the highest level by *The Code* of the UNC system and by the Faculty Handbook of Western Carolina University. We recognize that faculty vary in their teaching, scholarly, and service activities, and that there is not a single model that defines success. We feel it is important to provide faculty with guidelines to help them and the University assess their productivity; however determination of whether faculty are meeting expectations in our department is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation at all levels is best assessed through consideration of the cumulative past record, and evidence for continued growth.

The central mission of the Chemistry & Physics faculty is to provide high quality education to students. We seek to actively engage students in learning using the teacher-scholar model that develops critical thinking, effective communication, and disciplinary-specific knowledge. Fundamental to student engagement are research and enrichment experiences outside of the classroom involving hands-on learning, scholarship, or service. We recognize that scholarship, teaching, and service are often intertwined, and that all are important in preparing students to excel in their chosen careers and to contribute to societal issues.

II. Domains of Evaluation

A. **Teaching** *(Faculty Handbook 4.04 & 4.05)*
   1. Teaching effectiveness is evaluated according to the following 7 dimensions:
      a) **Content expertise** – Effective teachers display knowledge of their subject matter. Content expertise includes the skills, competencies, and knowledge in a specific subject area in which the faculty member has received advanced experience, training, or education.
      b) **Instructional delivery skills** – Effective teachers communicate information clearly, create environments conducive to learning, and use an appropriate variety of teaching methods.
      c) **Instructional design skills** – Effective teachers design course objectives, syllabi, materials, activities, and experiences that are conducive to learning.

d) **Course management skills** – Effective teachers give timely feedback to students, make efficient use of class time, and handle classroom dynamics, interactions, and problematic situations (e.g., academic dishonesty, tardiness, etc.) appropriately.
e) **Evaluation of students** – Effective teachers design assessment procedures appropriate to course objectives, ensure fairness in student evaluation and grading, and provide constructive feedback on student work.
f) **Faculty/student relationships** – Effective teachers display a positive attitude toward students, show concern for students by being approachable and available, present an appropriate level of intellectual challenge, sufficient support for student learning, and respect diversity.
g) **Facilitation of student learning** – Effective teachers maintain high academic standards, prepare students for professional work and development, facilitate student achievement, and provide audiences for student work.

2. Methods of evaluation

a) Self-evaluation. Self-evaluation of teaching, addressing the 7 dimensions of effective teaching. *(4.05B2C)*
b) Peer review of teaching materials. The departmental AFE committee will review and evaluate teaching materials, including syllabi, examinations, study guides, handouts, assignments, etc. *(4.05B2B)*
c) Direct observation of instruction. All faculty will be evaluated by direct observation of teaching annually. *(4.05.B2B)*
d) Student assessment of instruction (SAI). All sections of all courses taught by all faculty will include SAIs using a form of the Senate-approved 20-item university-wide SAI instrument. The department will follow university guidelines for including open-ended questions. *(4.05B2A)*

3. General comments – Professional development activities in the area of teaching are valued and should be described and documented as appropriate for the specific review event. The Chemistry / Physics department recognizes that knowledge of the natural and technological worlds is changing and expanding rapidly. As a result, the way our students learn will change and evolve. The Chemistry & Physics department expects that (in addition to satisfactorily meeting University definitions of load and the seven dimensions of teaching), faculty must prepare students to contribute to society, to be able to understand science, and to be able to communicate in this changing world. To achieve these goals, we expect the cumulative record of individuals will reflect that. In order to "meet expectations" in the area of teaching, the faculty member must:

a) promote critical thinking by their students in addition to content knowledge
b) provide learning experiences for our students that include opportunities outside of the classroom, such as fieldwork, research, applied training, and service
c) teach a variety of courses, as needed by the program, that may include lower and upper level majors courses, liberal studies courses, and graduate level courses
d) engage in activities to promote ongoing innovation and improvement in their ability to meet the above goals

B. Scholarship *(4.05C)*

1. WCU recognizes as legitimate forms of scholarly activity the four types described by Boyer. Specific departmental perspectives on these categories, relative valuation of various forms of scholarly activity, and department-specific examples are described in this section. The Department of Chemistry & Physics recognizes that different faculty members might emphasize one of these forms of scholarship more than another, and all Boyer categories are valued equally.

1) Scholarship of discovery – Original research that advances knowledge.
2) Scholarship of integration – Synthesis of information across disciplines, across topics, or across time.
3) Scholarship of application – Application of disciplinary expertise with results that can be shared with and/or evaluated by peers. The external peer review must not be managed by the faculty member; the departmental TPR committee will determine the appropriate method of peer evaluation for the scholarship of application.
4) Scholarship of teaching and learning – Systematic study of teaching and learning processes.

An activity that qualifies as scholarship, regardless of type, must meet the following general criteria: (1) the activity is subjected to external peer review; (2) there is clear evidence of methodological rigor; (3) the activity results in substantive outcomes or implications beyond the scope of the activity itself; and (4) the outcomes are disseminated to a professional audience or scholarly community. These four criteria help to differentiate the scholarship of teaching and learning from teaching, and the scholarship of application from service/engagement. Peer review can include traditional forms (e.g., journal reviewers, editors, committees awarding grants), but it can also include a broader community of scholars.

2. Methods of evaluation – Scholarship in the Department of Chemistry & Physics, regardless of the Boyer category involved, will be evaluated based on the quality and quantity of the work. The department's TPR Advisory Committee will judge the merit of scholarship on a case-by-case basis following these general guidelines:

a) Research published in refereed journals is very highly valued. As the number of publications alone is not an accurate representation of scholarly productivity, the *value* of a particular contribution as well as a candidate's overall publication record will be evaluated based on several factors. The scientific merit of the research as well as the level of student engagement is of particular importance. Likewise, the importance of the journal in the candidate's field of study will also be evaluated.
    1. In the sciences, multiple author publications are the rule rather than the exception and it is expected that publications will have a number of student coauthors. Unless noted otherwise by the candidate, the TPR committee will assume that the lead author is the person most responsible for performing the experimental methods described in the article while the investigator designated as the corresponding author is most responsible for the intellectual content of the article. Publication as the corresponding

author is highly valued. The candidate will be responsible for including information regarding the corresponding author of manuscripts when appropriate.

2. Faculty members may also publish work done in collaboration with scientists from other universities, government agencies, or industry, as is commonplace in the sciences. This collaboration may provide complimentary instrumentation, expertise, and skills to an investigation in addition to that available at WCU. In such cases, the candidate should note the role of each investigator in the completion of the research presented.

b) The department highly values collaboration among researchers at WCU. Particular merit is given to collaborative research with students. For departmental disciplines with undergraduate and graduate degree programs, a faculty member is expected to actively engage students in their research program. Disciplines without degree programs are encouraged to work with student researchers.

c) Presentations at national or international conferences are valued more highly than presentations at regional or local conferences. Presentations in the discipline are more highly valued than presentations at more general meetings. Likewise, invited presentations at a conference are more highly valued than contributed presentations.

d) Patents that have been granted and are externally peer-reviewed and are highly valued. Patents with provisional status, i.e. under USPTO protection, are by their nature, not peer-reviewed but still valued.

e) Publishing a book or book chapter in the area of the candidate's expertise with a recognized publishing outlet is highly valued.

f) All faculty are expected to submit competitive proposals for available internal funding. For faculty members that require significant funding to support their research programs, external grant funding is expected. For faculty members with research programs that may be conducted with minimal funding, writing proposals for external grants is nevertheless strongly encouraged and highly valued. The department highly values the receipt of grants that do not contain indirect costs as these monies can often be used to obtain the preliminary data needed to secure grants that do include indirect costs. The department considers receiving research grants that include indirect costs to the university to be exemplary. The department also values, albeit to a lesser extent:

    a. The receipt of grants for building departmental instrumentation infrastructure
    b. The receipt of grants that are for pedagogical research or designed to allow for improvements to individual courses or overall curricula.
    c. Continued improvement in the grant writing efforts of junior faculty as evidenced by increasingly positive reviews from unfunded grants; the department recognizes that there is value associated with writing grant proposals, even those that are not funded.

3. **General comments** – The department expects faculty members to engage students, especially undergraduate, in original research projects. This is considered to be a significant portion of each faculty member's scholarly activity. Although the engagement of undergraduates in research may reduce scholarly productivity in the forms of publications and grant proposals, these activities are part of our core mission and values, and all faculty members are expected to participate.

Summary of Activities that are highly valued in the Department

Discovery-based peer-reviewed publications
Funded external grant proposals
Approved patents and/or patent applications
Invited presentation at a conference
Contributed presentation at a national or international conference
Working with graduate and/or undergraduate students on research

Summary of Activities that are valued in the Department

Submitted external grant proposals
Unfunded external proposals with positive reviews
Funded internal proposals
Research presentations at regional conferences
Peer-reviewed publications other than discovery-based
Discovery-based non peer-reviewed publications

C. Service *(4.04.C.3 and 4.05.D)*

1. **Types of service:**
   a. **Institutional service** – committee service, recruiting, faculty governance, search committees, and mentoring, at all levels, including department, college/school, and university, and contributions to accreditation documents, administrative duties such as department head, a major role in faculty governance, etc.
   b. **Community engagement** – providing disciplinary expertise to civic, economic, or educational entity at the local, regional, or national level.
   c. **Special expertise, unusual time commitments, or exceptional leadership** - includes service in professional organizations
   d. **Advising – (**Applicable only to programs with majors) – includes being informed about curriculum and related processes, availability to advisees, assistance with academic and career planning (includes thesis committee service as well as advising student professional organizations). The quality of student advising will be evaluated in conjunction with university policies and procedures.

2. **Methods of evaluation –** The faculty member's listing of service/engagement activities will be examined and evaluated with regard to time and energy requirements, level of expertise involved, available quantitative/qualitative data (e.g., number of advisees, advisor evaluations by students, etc.), and other indicators of quality of service, including documentation or artifacts included in the appropriate dossier appendix.

3. **General comments** – Faculty members are expected to participate in institutional service and, where appropriate, to be active and competent advisors to students. In addition, the faculty member is expected to exhibit significant contributions in at least one of the areas of service/engagement, which may be institutional, community, or professional organizations. Excellence in at least one area of service is preferable to minimal participation in several areas of service.

III. Specific Procedures for Review Events

A. Annual Faculty Evaluation

1. **Overview –** All instructional faculty (tenured, tenure-track, fixed-term, and instructors) regardless of status or participation in other review processes, are evaluated annually. Instructors are evaluated only on teaching, unless they request review of research and/or service. Fixed-term faculty are evaluated only on teaching and service unless they request review of research. This performance evaluation serves as an active, ongoing monitoring of faculty effectiveness. Deadlines for completion of the review process are determined by the Dean and Provost.

2. **Composition of review committee** – A departmental AFE committee is elected annually at the first department meeting of the academic year in August. The AFE faculty committee reviews each AFE file in April, and submits the committee's evaluation to the faculty member and the department head. The departmental AFE committee evaluates all tenured, tenure-track, and full time faculty members. Only the department head evaluates part-time faculty members. The committee will consist of three tenured or tenure-track faculty members who have been in the department at least two years. The committee chair must be tenured. The Department Head shall not be a member or an observer of this committee. The Department Head submits a separate AFE evaluation of every faculty member.
    a. The committee shall be elected by all full time faculty.
    b. The length of service for tenured faculty is two years with staggered appointments. The length of service for untenured faculty is one year.
    c. When a member of this committee is being reviewed, the Department Head shall appoint an alternate faculty member with prior committee experience to sit for the evaluation. It is likely that this alternate will be a tenured faculty member that most recently served on the committee.

d. The expectation is that all tenured and tenure-track faculty within the Department shall be willing to serve on this committee on a rotating basis.

3. Procedures and preparation of documentation

All full-time faculty members must prepare an AFE document that includes the completion of the *Chemistry & Physics Annual Report of Faculty Activities table* (found at the end of this document) plus the following materials:

a) Teaching

i) A self-evaluation addressing the seven teaching dimensions of teaching (as outlined in Section II.A.1. above), a statement of teaching philosophy, a description of goals, methods, and strategies used; and selected teaching materials for courses taught during the period of review.
ii) Copies of peer evaluations of teaching materials.
iii) Direct observation of classroom teaching at least every semester during the first two years of appointment, and then at least once each year after the second year. These observations will be done by a tenured faculty member, preferably in the discipline.
iv) Student Assessment of Instruction every semester. See pages 18-20.

b) Scholarship and Creative Activity

These activities will be summarized in the *Chemistry & Physics Annual Report of Faculty Activities*. This summary is optional for fixed-term faculty. See pages 18-20.

c) Service

These will be summarized in the *Chemistry & Physics Annual Report of Faculty Activities*. This summary is optional for lecturers. See pages 16-18.

Specific guidelines for preparation of the AFE document

a) Faculty will submit their AFE documents to the AFE Peer Review Committee. The deadline for submission is April 1st, or a date specified by the Department Head.
b) The materials to be submitted for this spring evaluation will include student evaluations from the previous spring and fall semester courses.
c) In the area of scholarship, tenured and tenure-track faculty shall provide a five year record of cumulative scholarship, including new faculty who have worked elsewhere. Evaluation of the academic year under consideration will be done in the context of the five year record.
d) The Committee will review the AFE materials and make comments regarding teaching, scholarship, and service. A single written statement (report) will be prepared by the committee and forwarded to the Department Head. The letter will be signed by the Committee members.

e) The Department Head will evaluate the faculty member independently from AFE committee. Both the Department Head and the AFE committee's evaluation will be provided to the Dean for review. Both of these evaluations will also be included in dossiers for tenure, promotion, reappointment, or post-tenure review.
f) After a faculty member has completed 3 years towards tenure, the Department Head's statement will include a cumulative assessment of the faculty member's progress toward tenure in each of the 3 areas of teaching, scholarship, and service. This will be continued in subsequent years until the faculty member has achieved tenure.

B. Evaluation of part-time/non-tenure-track instructors (4.05 F)

1) Procedures for Lecturers and Fixed-term Instructors.

See procedures above.

2) Procedures for part-time instructors.

a) Materials for review

i. Submit copies of syllabi, final exams, and selected examples of materials that exemplify the course learning environment to the department's administrative assistant each term for each different course taught. These are kept on file.

ii. For the first four semesters of teaching, arrange to have a tenured member of the Department observe and write an evaluative report of at least one class per academic semester. When possible, this observation should be completed by a faculty member with the same disciplinary background as the course. The written report must be submitted to the Department Head.

iii. Submit to the Department Head a brief (one page) teaching self-report to include statements on teaching philosophy, a description of how the philosophy is reflected in their courses, and an assessment of teaching effectiveness.

iv. Include summaries of the university student assessment of instruction (student evaluations of teaching) surveys for each course taught.

b) Process of Evaluation

i. For individuals hired for one semester, the above materials must be submitted by the last day of classes for the teaching assignment. For those hired to teach both terms for the academic year, this AFE procedure must be completed by April 1st. It is the instructor's responsibility to be sure the steps outlined above are completed by the deadlines.

ii. Each part time faculty member will receive a written AFE from the Department Head. The student evaluations, the teaching observation letter, and the Department Head's evaluation will be presented to each Faculty member (in writing). If desired or necessary, the Department Head will meet with each Faculty member individually to review the documents, and both will sign to verify the meeting.

C. Reappointment, Tenure, and Promotion (4.06 & 4.07)

1. **Overview -** The Office of the Provost will generate an annual list of faculty eligible for tenure and reappointment.
2. **Composition of review committees**
   a) The departmental TPR Advisory Committee shall be chaired by the department head (non-voting) and shall be composed of up to six tenured faculty members elected annually by the department's tenured and tenure-track faculty. In the event that there are six or fewer tenured faculty, the committee shall be composed of the department head and tenured faculty, providing that the resultant committee shall consist of at least three members, exclusive of the department head. In the event that there are less than three tenured faculty, the department, in consultation with the dean, selects tenured faculty from similar departments to constitute a committee of at least three.
   b) The College TPR Advisory Committee shall be chaired by the dean (non-voting) and shall be composed of faculty members of the college as specified in the Faculty Handbook.
   c) The University TPR Advisory Committee shall consist of the Provost as chair (non-voting); the Dean of the Graduate School, and faculty members of the University as specified in the Faculty Handbook.
3. **Procedures and preparation of documentation –** as noted above, detailed instructions for preparing the dossier are issued annually by the Office of the Provost. The candidate will need (1) the departmental CRD, (2) the Guidelines for Preparation of the Dossier, and (3) the timetable for the review process.

D. Post-Tenure Review (4.08)

1. Overview –
The Department of Chemistry & Physics will conduct a post-tenure review (PTR) on all tenured faculty members. Each faculty member shall be evaluated by the same criteria and by the same processes. The purpose of the evaluation "is to support continuing faculty development, to promote faculty vitality, and to encourage excellence among tenured faculty." The review will be consistent with the Western Carolina University Post Tenure Review Policies and Procedures: these criteria, guidelines and procedures are supplementary to that document. The criteria by which a faculty member will be

evaluated are outlined in section II of this document. These criteria include quality and effectiveness of teaching, research and scholarly activities, and service. Exemplary faculty performance, as determined by the department, involves sustained excellence in teaching, scholarly achievement, and service.

2**. Composition of review committee –**

a. PTR reviews are done by a committee of three (3) tenured departmental colleagues. If three tenured colleagues are unavailable for the review, the matter will be sent to the Dean of the College of Arts and Sciences. The Dean, in consultation with the tenured faculty of the department, will select tenured faculty from similar departments to constitute a committee of three (3) tenured faculty for the department.

b. The Department Head assigns tenured faculty to the PTR review teams, who then conduct the review and write the report.

3**. Procedures and preparation of documentation-**

a. Faculty members affected by this policy include all tenured faculty in the Department of Chemistry & Physics. Formal PTR reviews must occur no later than the fifth year following the awarding of tenure and/or promotion and a PTR review must occur at least once every five years.

b. Faculty on leave will not have that leave period count as part of the five years between review events; faculty temporarily assigned away from Cullowhee at the time a review is scheduled will be reviewed the next academic year they resume responsibilities in the area.

c. PTR reviews are based on the work completed since the previous review and include: (a) the four most recent AFE evaluations and supporting materials and (b) a current curriculum vita.

d. Peer reviewers will present a copy of their evaluation to the department head. Peer reviews are to be completed in April, in accord with a calendar established by the department head.

Responsibility of Each Tenured Faculty Member

a. Each tenured faculty member is responsible for maintaining documents that support their activities for the previous four years. The items to be included are those presented for the Annual Faculty Evaluation process.

b. Each tenured faculty member is responsible for including the previous four Annual Faculty Evaluation summary statements from the AFE committee and the department head. They must also include a self-statement of teaching and advising effectiveness.

Responsibility of the Department Head

a. The Department Head establishes and circulates the timetable for the PTR and defines when written reports are due. Faculty under consideration for PTR will be given at least one month to prepare their documents.

b. The Department Head meets with the faculty members undergoing PTR review to discuss the written report. This is done either in late April or early May.

c. The Department Head appends an evaluation to that written report relative to the mission of the university, college and department, to which the faculty member undergoing PTR review has the option of attaching a written response.

d. In the case of an unsatisfactory review, the department head will, in consultation with the faculty member, the PTR review committee, and the College Dean, develop a three (3) year plan for improvement. That plan will be done within one (1) month of the PTR review. That plan will include (a) specific areas of improvement; (b) resources available for that improvement; and (c) administrative support provided. The plan will also include consequences for failure to make adequate progress by the third year.

e. The Department Head will, in conjunction with the PTR review team, monitor the progress of that plan and provide oral and written assessments of that progress to the faculty member every six (6) months.

Responsibility of the Review Team

a. The Review Team will, in accord with the schedule established, review the materials provided by the PTR candidates.

b. The Review Team will, in accord with the schedule established, provide the Department Head with a written statement of the committee's findings.

c. The Review Team will collaborate with the Department Head, in the event of an unsatisfactory review, on the development of an improvement plan and the semi-annual monitoring of that plan.

Due Process

a. Disciplinary actions for noncompliance with the improvement plan are limited to those established in Chapter VI of The Code.

b. Due process and right of appeal are specified in The Code and in the "Tenure Policies and Regulations of Western Carolina University" in the Faculty Handbook and are guaranteed.

IV. The criteria for meeting expectations in the Department of Chemistry & Physics

A. Annual Faculty Evaluation (4.05)

1. Teaching

During the Annual Faculty Evaluation process, individual faculty will be evaluated relative to criteria described in this document as they relate to the nature of the faculty member's appointment and their rank.

2. Scholarship

During the Annual Faculty Evaluation process, individual faculty members will be evaluated relative to criteria described in this document, as they relate to the nature of the faculty member's appointment and their rank.

3. Service

During the Annual Faculty Evaluation process, individual faculty will be evaluated relative to criteria described in this document as they relate to the nature of the faculty member's appointment and their rank.

4. General comments

B. Reappointment (4.06)

1. Teaching -

Teaching: To achieve the teaching mission and aspirations of WCU, and the strategic goals of the Department of Chemistry & Physics, the Department of Chemistry & Physics faculty have expectations of how and what we teach. We expect that in addition to satisfactorily meeting University definitions of load and the seven dimensions of teaching (as describe above), faculty must prepare students to contribute to society, be able to understand science, and be able to communicate in this changing world. To achieve these goals, we expect the cumulative record of individuals will reflect that:

- Their courses promote critical thinking in addition to content knowledge.
- They provide learning experiences for our students that include opportunities outside of the classroom, such as research or other appropriate opportunities.
- They are expected to teach a variety of courses as needed by the program that may include lower and upper level major's courses, liberal studies courses, and graduate level courses.

2. Scholarship –

Scholarly Activity: All tenure-track faculty members must show evidence of the development of a sustainable research program with anticipated future progress. This evidence may include peer-reviewed publications, patents, oral presentations, the submission of proposals and/or receipt of grants, research in progress, engagement of students in research, unpublished research and manuscripts, external seminars, and other indications of keeping current in the field. In assessing scholarly activity, the department places the highest value on peer-reviewed publications and patents. The overall quality of the work, as judged by the departmental TPR committee, is the most important consideration in determining the value of the scholarly activity.

3. **Service** –
Service/Engagement: faculty must show meaningful participation in program and departmental activities, especially where the faculty member can make substantive contributions (e.g. curriculum, advising). Faculty members are also expected to serve on some combination of college or university level committees, discipline-based service to the community/society (which may include work with public schools), or service to the profession. Junior faculty are discouraged from serving on college- or university-wide committees until after their second year of appointment.

4. **General comments –**
Determination of whether faculty members are meeting expectations for reappointment is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

B. Tenure (4.07)

1. **Teaching** –
Teaching: In addition to the criteria described for reappointment, a faculty member must have demonstrated a consistent and high record of teaching over several years with evidence for future growth. The faculty member must have demonstrated proficiency in a range of teaching preparations, which might include teaching at different levels (from introductory and liberal studies courses to upper level courses in the major) and class types (traditional lecture courses, laboratory courses, and, where appropriate, research projects with students).

2. **Scholarship** –
Scholarly Activity: In order to receive tenure, a faculty member must show evidence of the development of a sustainable research program with evidence for future growth. In addition to the criteria described for reappointment, a faculty member must have published in peer-reviewed journals and actively engaged students in research. For faculty members that require significant funding to support their research programs, external grant funding is expected. In general, a faculty member is expected to have multiple peer-reviewed publications (journal manuscripts, patents, book chapters, etc.) to obtain tenure, with at least one publication from research conducted while at WCU. However, there may occasionally be an exceptional case in which a faculty member would have one strong publication that would represent a significant amount of research, but this would not be the typical case. The number of publications alone, however, is not an accurate representation of scholarly productivity. The scientific merit of the research presented and level of student engagement evidenced in the candidate's overall publication record must be evaluated. Likewise, the *value* of a particular contribution to the candidate's field, as evidenced by the importance of the

journal in which the manuscript is published is also of significance. In the tenure decision, both publication quantity and quality will be assessed by the departmental TPR committee.

To help guide the actions of college and university committees, the departmental TPR committee will provide a written evaluation of the strengths of the candidate's scholarly activity. There must be evidence of a research plan that shows promise of continued productivity in the future. The scholarship of application and the scholarship of teaching and learning are valued, but must not represent the sole form of scholarship in the granting of tenure.

3. **Service** –
Service/Engagement: In addition to the criteria described for reappointment, a faculty member must have engaged in service beyond the department prior to the granting of tenure. This type of service must include serving on college/university level committees, discipline-based service to the community/society, or service to the profession.
4. **General comments –**
Determination of whether faculty members are meeting expectations for tenure is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

C. Promotion to Associate Professor (4.07)

1. **Teaching** –
Teaching: In addition to the criteria described for reappointment, a faculty member must have demonstrated a consistent record of teaching excellence over several years with evidence for future growth. The faculty member must have demonstrated proficiency in a range of teaching preparations, which includes teaching at different levels (from introductory and liberal studies courses to upper level and graduate level courses in the major) and class types (traditional lecture courses, independent research).

2. **Scholarship** –
Scholarly Activity: In order to be promoted, a faculty member must show evidence of the development of a sustainable research program with evidence for future growth. In addition to the criteria described for reappointment, a faculty member must have published in peer-reviewed journals, actively engaged students in research, and submit research proposals for external funding when necessary to support their scholarly activity. In general, a faculty member is expected to have multiple peer-reviewed publications (journal manuscripts, patents, book chapters, etc.) to obtain tenure, with at least one publication from research conducted while at WCU. However, there may occasionally be an exceptional case in which a faculty member would have one strong publication that would represent a significant amount of research, but this would not be the typical case. The number of publications alone, however, is not an accurate representation of scholarly productivity. The scientific merit of the research presented and level of

student engagement evidenced in the candidate's overall publication record must be evaluated. Likewise, the *value* of a particular contribution to the candidate's field, as evidenced by the importance of the journal in which the manuscript is published is also of significance. In the promotion decision, both publication quantity and quality will be assessed by the departmental TPR committee.

To help guide the actions of college and university committees, the departmental TPR committee will provide a written evaluation of the strengths of the candidate's scholarly activity. There must be evidence of a research plan that shows promise of continued productivity in the future. The scholarship of application and the scholarship of teaching and learning are valued, but must not represent the sole form of scholarship in the granting of promotion.

3. **Service** –
Service/Engagement: In addition to the criteria described for reappointment, a faculty member must have engaged in service beyond the department prior to promotion to Associate Professor. This type of service must include serving on college/university level committees, discipline-based service to the community/society, or service to the profession. The quality of the service, as judged by the departmental TPR committee, is the most important consideration in determining the value of the service.

4. **General comments –**
Determination of whether faculty members are meeting expectations for promotion is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

D. Promotion to Full Professor (4.07)

1. **Teaching** –
Teaching: Faculty should show continued progress on the trajectory established in earning tenure and promotion to Associate Professor, and should demonstrate superior teaching and leadership as a teacher. Evidence of this leadership could include publications related to pedagogy, the receipt of grants involving science education, the mentoring of junior faculty, or participation (as a leader) in teaching workshops or seminars.

2. **Scholarship** –
Scholarly Activity: Faculty should show continued progress on the trajectory established in earning tenure or promotion to Associate Professor as evidenced by activities required for tenure, but also should show evidence of their scholarship having a broader and long-lasting impact on their discipline, education, and community.

In addition to the criteria described for tenure and promotion to Associate Professor, a faculty member is expected to have a distinguished record of publication in highly regarded peer-reviewed journals in their field, engage students in research, and receive external funding to support their scholarly activity. It is expected that the candidate will be the corresponding author in a significant number of publications. A patent may be a substitute for a publication, assuming the candidate provides sufficient evidence of the quality of the research.

To help guide the actions of college and university committees, the departmental TPR committee will provide a written evaluation of the strengths of the candidate's scholarly activity. There must be evidence of a research plan that shows promise of continued productivity in the future. The scholarship of application and the scholarship of teaching and learning are valued, but must not represent the sole form of scholarship for promotion to Full Professor.

3. **Service** –
Service/Engagement: In order to be promoted to Full Professor, Faculty members are expected to demonstrate superior contributions to service. This type of service must include serving on college/university level committees, discipline-based service to the community/society, or service to the profession. This service should reflect clear evidence of a superior level of performance, which would include the evolution of the faculty member from a participant to a leader in service activities. The quality of the service, as judged by the departmental TPR committee, is the most important consideration in determining the value of the service.

4. **General comments –**
Determination of whether faculty members are meeting expectations for promotion is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

E. Post-Tenure Review (4.08)

Tenured faculty members who have been at WCU for lengthy careers have much to offer the department. These faculty members are our primary sources of institutional history and operations.

1. **Teaching** –
Teaching: Faculty must satisfy the criteria for reappointment, and must be engaged in other activities that are consistent with his or her rank as described above.

2. **Scholarship –**
Scholarly Activity: In addition to the criteria described for reappointment, a faculty member must demonstrate scholarship in any of the four areas of scholarship (along a trajectory since the last review) by involving students in

research, demonstrating ability to receive grant proposals to obtain funding necessary to carry out research, and having a research plan that promises continued productivity in the future.

3. **Service –**
Service/Engagement: In addition to the criteria described for reappointment, a faculty member must demonstrate service contributions above the program/department level. This type of service must include serving on college/university level committees, discipline-based service to the community/society, or service to the profession.

4. **General comments –**
Determination of whether faculty members are meeting expectations for post-tenure review is not solely gauged by the sum of selected accomplishments. Instead, faculty evaluation is assessed through consideration of the cumulative past record, and evidence for continued growth.

Approved by:

______________________________	____________
Department Head	Date
______________________________	____________
Dean	Date
______________________________	____________
Provost	Date

Department of Chemistry & Physics
Annual Report of Faculty Activities

NAME:

I. TEACHING

A. Spring 2008

	Course Name and Number	Credit Hours	Contact Hours	Number of Students	Number of Evaluations
1.					
2.					
3.					
4.					
	TOTALS:				

B. Fall 2008

	Course Name and Number	Credit Hours	Contact Hours	Number of Students	Number of Evaluations
1.					
2.					
3.					
4.					
	TOTALS:				

C. Summer 2008

	Course Name and Number	Credit Hours	Contact Hours	Number of Students	Number of Evaluations
1.					
2.					
3.					
4.					
	TOTALS:				

D. Year Totals:

TOTALS:				

A. List new courses taught.

B. Release time (if any: List by Semester and give reason (e.g. new faculty, developed new course, Program Director or Coordinator, etc)

II. PROFESSIONAL ACTIVITIES

A. Publications during the 12-month period (Show citation and co-authors.) (*Refereed Journals)

B. Other Research, Papers Read, Workshops conducted, Creative Activity:

1. Papers in Press:

2. Presentations:

3. Creative Activities:

4. On-going/unpublished:

5. Internal Proposals Submitted (Show list of co-authors in order submitted)

6. Internal Proposals Funded (Show list of co-authors in order submitted)

7. External Proposals Submitted. Indicate if it is a grant or contract request. (Show list of co-authors in order submitted)

8. External Proposals for Grants/Contracts Funded. Indicate if it is a grant or contract. (Show list of co-authors in order submitted)

C. List workshops, conferences attended related to instruction.

D. Professional Organization Memberships:

1. Offices Held

2. Professional Committees

E. Honors & Awards:

III. SERVICE ACTIVITIES

A. On-campus committees (list by name) *Committee Chair

1. University Offices and Committees:

2. College Committees:

3. Department Committees:

B. Advising

1. # Dept. Advisees: (undergraduate and graduate)

2. Recruitment Activities:

3. Student Theses, Projects, Committees, etc:

4. Students directly supervised (do not list students registered under your name as instructor of record but actually supervised by someone else) (include course name and number, credit hours, number of students and a 1-2 line description of each project)

5. Assessment of advising (indicating advising of demonstrated quality). Include student assessment of instruction (evaluations) for CHEM 380, PHYS 380, CHEM 698, 699, & 799 as an indication of assessment of advising for research.

C. Local, Regional and National Service Activities

D.6 Full-time equivalents (FTEs) for the previous three years

Instructor	S09	Sum09	F09	S10	Sum10	F10	S11	Sum11	F11
Arrington, Megan	-	-	-	-	-	0.40	1.74	0.29	0.95
Atterholt, Cynthia	0.15	-	0.20	0.35	-	0.21	0.14	0.01	0.29
Butcher, David	0.06	0.01	0.46	0.11	0.01	0.41	-	-	0.94
Butcher, Karen	0.66	0.29	0.80	0.57	0.23	1.46	1.39	0.28	1.81
Clement, Jason	0.09	-	0.15	0.25	0.01	1.13	0.60	-	0.65
Clement, Suet-Hing	-	-	-	0.30	0.21	0.35	0.25	0.13	0.36
Coburn, Christopher	0.06	-	-	0.05	-	-	-	-	-
Davis, Paul	-	-	-	0.39	0.08	0.13	0.61	-	0.12
De Silva, Channa	-	-	-	-	-	0.90	0.23	0.18	0.97
Dewald, Laura	-	-	0.01	-	0.01	-	-	-	-
Dewanti, Asteriani	0.61	-	0.23	0.46	-	-	-	-	-
Dinkelmeyer, Brian	0.41	0.02	0.81	0.70	0.06	0.74	0.73	0.02	0.15
Embrick, Lura	0.89	0.39	1.78	0.79	0.50	-	-	-	-
Evanoff, David	0.36	-	0.42	0.07	0.02	0.10	0.29	0.03	0.58
Huffman, Carmen	0.27	-	0.90	0.22	-	0.47	0.27	-	0.14
Huffman, Scott	0.23	0.01	0.18	0.25	0.01	0.43	0.32	-	0.25
Kwochka, William	0.40	-	0.45	0.51	-	0.62	0.13	-	0.43
Marth, Charles	0.24	0.23	0.64	0.59	0.25	0.20	0.81	0.53	0.65
McCullough, Emily	1.13	0.20	1.80	1.37	-	-	-	-	-
McMahan, Robert	-	-	-	0.04	-	-	-	-	-
Michaelis, Ron	-	-	0.12	-	-	0.11	-	-	0.14
Miller, Jerry	-	-	-	0.02	-	0.03	0.01	0.01	-
Salido, Arthur	0.59	-	0.44	0.21	-	0.89	0.44	-	0.83
Summers, Jack	0.88	-	0.54	0.67	-	0.43	0.64	0.01	0.57
Unknown	0.02	0.05	-	-	-	-	-	-	-
Van Dyke, Michael	-	-	-	-	-	1.38	0.74	-	1.63
Van Dyke, Natalya	-	-	-	-	-	0.84	-	-	-
Wilson, Mark	0.06	-	0.17	0.62	-	-	0.05	-	0.02
Total	7.10	1.19	10.10	8.53	1.39	11.22	9.39	1.48	11.48
Yearly Total		18.40			21.15			22.35	

D.7 Student credit hour (SCH) production for the previous three years

Instructor	S09	Sum09	F09	S10	Sum10	F10	S11	Sum11	F11
Arrington, Megan	-	-	-	-	-	164	708	116	385
Atterholt, Cynthia	33	-	78	142	-	84	51	1	119
Butcher, David	13	1	178	21	1	168	-	-	382
Butcher, Karen	267	117	324	231	93	592	564	114	736
Clement, Jason	31	-	46	68	4	441	221	-	214
Clement, Suet-Hing	-	-	-	120	84	143	102	52	148
Coburn, Christopher	18	-	-	12	-	-	-	-	-
Davis, Paul	-	-	-	160	32	51	246	-	48
De Silva, Channa	-	-	-	-	-	364	66	71	379
Dewald, Laura	-	-	5	-	6	-	-	-	-
Dewanti, Asteriani	238	-	88	187	-	-	-	-	-
Dinkelmeyer, Brian	151	3	304	270	13	283	271	3	48
Embrick, Lura	360	160	724	320	204	-	-	-	-
Evanoff, David	146	-	112	15	3	18	105	12	216
Huffman, Carmen	107	-	346	91	-	188	110	2	40
Huffman, Scott	90	2	63	103	4	147	129	-	100
Kwochka, William	149	-	177	184	-	220	47	-	163
Marth, Charles	99	93	259	240	102	53	328	216	265
McCullough, Emily	460	80	732	555	-	-	-	-	-
McMahan, Robert	-	-	-	8	-	-	-	-	-
Michaelis, Ron	-	-	48	-	-	45	-	-	57
Miller, Jerry	-	-	-	3	-	6	2	1	-
Salido, Arthur	205	-	180	59	-	354	179	-	313
Summers, Jack	321	-	212	264	-	174	259	4	232
Unknown	5	22	-	-	-	-	-	-	-
Van Dyke, Michael	-	-	-	-	-	561	300	-	661
Van Dyke, Natalya	-	-	-	-	-	342	-	-	-
Wilson, Mark	16	-	46	238	-	-	10	-	3
Total	2709	478	3922	3290	546	4398	3698	592	4509
Yearly Total		7109			8234			8799	

D.8 Course load and enrollment by instructor for the previous three years

Summer data was not included but can be made available upon request.

Instructor	F08	S09	F09	S10	F10	S11
Arrington, Megan						
# of Courses	-	-	-	-	5	12
Contact Hours	-	-	-	-	18	-
Credit Hours	-	-	-	-	4	16
Enrollment	-	-	-	-	120	347
Atterholt, Cynthia						
# of Courses	2	1	3	2	3	2
Contact Hours	5	3	5	12	11	3
Credit Hours	2	3	7	6	7	6
Enrollment	24	11	27	36	29	17
Bintz, Brittania						
# of Courses	4	-	-	-	-	-
Contact Hours	21	-	-	-	-	-
Credit Hours	11	-	-	-	-	-
Enrollment	83	-	-	-	-	-
Butcher, David						
# of Courses	3	4	2	4	1	2
Contact Hours	23	21	14	27	-	12
Credit Hours	10	10	7	12	4	-
Enrollment	51	5	45	7	42	47
Butcher, Karen						
# of Courses	9	11	18	12	15	8
Contact Hours	18	37	78	47	90	45
Credit Hours	12	7.5	9	6	12	12
Enrollment	184	263	450	324	401	254
Clement, Jason						
# of Courses	4	4	5	6	7	8
Contact Hours	15	24	15	32	35	39
Credit Hours	9	7	10	16	21	24
Enrollment	53	38	42	30	124	65
Clement, Suet-Hing						
# of Courses	-	-	-	4.167	3.333	3
Contact Hours	-	-	-	14.833	6.667	1
Credit Hours	-	-	-	5.667	5.667	5.5
Enrollment	-	-	-	72	82	62
Coburn, Christopher						
# of Courses	-	1	-	0.5	-	-
Contact Hours	-	3	-	1.5	-	-
Credit Hours	-	3	-	1.5	-	-
Enrollment	-	6	-	4	-	-

Instructor	F08	S09	F09	S10	F10	S11
Davis, Paul						
# of Courses	-	-	-	1	2	5
Contact Hours	-	-	-	5	9	13
Credit Hours	-	-	-	4	3	8
Enrollment	-	-	-	40	37	157
Dewald, Laura						
# of Courses	-	-	2	-	-	-
Contact Hours	-	-	-	-	-	-
Credit Hours	-	-	5	-	-	-
Enrollment	-	-	2	-	-	-
Dewanti, Asteriani						
# of Courses	12	5.5	6	3.5	-	-
Contact Hours	53	29.5	21	12.5	-	-
Credit Hours	17	18.5	7	5.5	-	-
Enrollment	217	63	105	89	-	-
Dinkelmeyer, Brian						
# of Courses	4	4	7	6	7	14
Contact Hours	20	20	35	32	32	54
Credit Hours	9	9	20	17	21	18
Enrollment	37	66	88	80	81	216
Embrick, Lura						
# of Courses	4	4	4	4	-	-
Contact Hours	16	19	22	18	-	-
Credit Hours	11	12	16	8	-	-
Enrollment	133	107	181	109	-	-
Evanoff, David						
# of Courses	2	2	4	2	2.5	3
Contact Hours	11	12	16	8	15	11
Credit Hours	7	6	9	3	3.5	7
Enrollment	69	37	49	14	24	42
Huffman, Carmen						
# of Courses	1	3	3.667	3	3.667	2.5
Contact Hours	9	18	20	15	17	13.5
Credit Hours	3	8	12	7	8	5.5
Enrollment	1	43	90	36	70	42
Huffman, Scott						
# of Courses	5	5	7	4	5	5
Contact Hours	19	21	39	17	22.5	23
Credit Hours	10	7	13	4	10	6
Enrollment	57	69	61	74	60	93

Instructor	F08	S09	F09	S10	F10	S11
Kwochka, William						
# of Courses	4	4	4	7	5.75	4
Contact Hours	24	21	24	42	29.5	23
Credit Hours	10	10	10	19	15.5	9
Enrollment	64	55	65	69	79	23
Marth, Charles						
# of Courses	13	7	12	7.33	15	7
Contact Hours	29	23	27	17.99	35	14
Credit Hours	7	7	7	10.32	5	9
Enrollment	259	116	286	149	292	198
McCullough, Emily						
# of Courses	7	11	8	10.68	-	-
Contact Hours	24.5	26.5	26	28.06	-	-
Credit Hours	12	14	20	10.72	-	-
Enrollment	152	260	243	310	-	-
McMahan, Robert						
# of Courses	-	-	-	0.25	-	-
Contact Hours	-	-	-	0.75	-	-
Credit Hours	-	-	-	0.75	-	-
Enrollment	-	-	-	3	-	-
Michaelis, Ron						
# of Courses	0.5	-	1	-	1	-
Contact Hours	1.5	-	3	-	3	-
Credit Hours	1.5	-	3	-	3	-
Enrollment	16	-	16	-	15	-
Miller, Jerry						
# of Courses	-	-	-	1	2	1
Contact Hours	-	-	-	9	9	-
Credit Hours	-	-	-	3	6	2
Enrollment	-	-	-	1	2	1
Salido, Arthur						
# of Courses	7	5	5	6	5	3
Contact Hours	36	18	26	33	35	3
Credit Hours	14	14	8	12	14	6
Enrollment	42	66	83	47	107	68
Summers, Jack						
# of Courses	5	5	5	6	4	4
Contact Hours	27	27	27	20	18	18
Credit Hours	13	17	12	16	10	13
Enrollment	59	83	79	87	50	67

Instructor	F08	S09	F09	S10	F10	S11
Unknown						
# of Courses	-	4	-	-	-	-
Contact Hours	-	12	-	-	-	-
Credit Hours	-	5	-	-	-	-
Enrollment	-	45	-	-	-	-
Van Dyke, Natalya						
# of Courses	-	-	-	-	9	-
Contact Hours	-	-	-	-	29	-
Credit Hours	-	-	-	-	9	-
Enrollment	-	-	-	-	291	-
Wilson, Mark						
# of Courses	1	1	4	2.24	-	3.5
Contact Hours	6	3	9	14.7	-	24
Credit Hours	2	2	11	7.71	-	8.5
Enrollment	2	8	16	60	-	4
De Silva, Channa						
# of Courses	-	-	-	-	2.25	4
Contact Hours	-	-	-	-	1.5	22.5
Credit Hours	-	-	-	-	8.5	10
Enrollment	-	-	-	-	93	29
Van Dyke, Michael						
# of Courses	-	-	-	-	7	2.75
Contact Hours	-	-	-	-	20	6.25
Credit Hours	-	-	-	-	13	7.75
Enrollment	-	-	-	-	183	84

E Documentation for Standard 5

E.1 Five year program profile

Sources: WCU Fact Books (http://www.wcu.edu/13166.asp) and Office of Institutional Planning and Effectiveness

BS Program

	07/08	08/09	09/10	10/11	11/12
Applicants	35	17	36	40	34
Admitted students	35	17	36	40	34
Enrolled students	31	17	34	40	34
Female students	14	9	15	19	19
Students graduated	12	16	20	11	??

MS Program

	07/08	08/09	09/10	10/11	11/12
Applicants	10	9	13	8	12
Admitted students	5	7	11	5	8
Enrolled students	4	7	8	5	3
Female students	2	2	2	3	2
Students graduated	4	2	10	5	4

MS degrees awarded compared to other programs at WCU:

Program	Sum07	F07	S08	Sum08	F08	S09	Sum09	F09	S10	Total
Chemistry	1	-	1	4	6	-	1	1	3	17
Biology	2	1	5	1	2	5	3	3	1	23
Applied Math	-	1	2	-	1	2	-	1	5	12
English	7	5	5	3	3	8	3	6	9	49
History	7	-	3	1	2	1	1	2	2	19
Political Science	-	6	5	3	9	9	1	6	12	51

Enrollment of Carnegie peers:

	2005	2006	2007	2008	2009	2010	2011	Average
California State University-Fresno								

	2005	2006	2007	2008	2009	2010	2011	Average
enrollment	7	8	7	9	7	8	11	8
degrees awarded	5	0	3	6	3	4	?	4
Eastern Illinois University								
enrollment	16	14	15	13	13	10	?	14
degrees awarded	5	0	3	5	1	4	?	3
Murray State University								
enrollment	15	18	26	23	?	?	23	21
degrees awarded	4	4	4	4	8	10	?	6
Pittsburg State University								
enrollment	7	10	?	?	?	?	?	9
degrees awarded	2	4	?	?	?	?	?	3
Sam Houston State University								
enrollment	8	8	7	8	5	9	10	8
degrees awarded	5	3	1	4	4	?	?	3
Southeast Missouri State University								
enrollment	13	9	11	9	19	27	17	15
degrees awarded	5	2	5	5	5	1	?	4
SUNY College at Oswego								
enrollment	?	8	6	7	8	8	9	8
degrees awarded	?	3	8	5	2	5	?	5
Western Illinois University								
enrollment	30	29	24	30	37	39	?	32
degrees awarded	3	7	13	16	10	12	19	11
WCU								
enrollment	17	12	13	15	18	16	11	15
degrees awarded	5	4	2	10	5	4	6	5

E.2 Academic qualifications of admitted students

BS Program

Year	SAT		HS GPA		HS Rank	
	WCU	chem majors	WCU	chem majors	WCU	chem majors
2007/2008	1022	1064	2.60	2.85	62	65
2008/2009	1036	1106	2.62	3.32	66	72
2009/2010	1034	1089	3.51	3.70	65	74
2010/2011	1042	1119	3.50	3.76	65	75
2011/2012	1041	1085	3.59	3.95	67	78
Average	1035	1093	3.16	3.52	65	73

MS Program

Data for the MS in chemistry (CHEM) has been compared to other Master's degree programs at WCU: MS in biology (BIOL) and MS in applied mathematics (MAAP).

Year	# of students			Percent completed			UG GPA		
	BIOL	CHEM	MAAP	BIOL	CHEM	MAAP	BIOL	CHEM	MAAP
03/04	7	8	10	57	50	70	3.41	3.69	3.42
04/05	12	12	5	75	67	60	3.24	3.13	3.46
05/06	6	6	7	83	50	71	3.27	3.29	3.58
06/07	13	4	4	69	50	100	3.33	3.65	3.33
07/08	15	8	6	47	50	50	3.35	3.21	2.98
08/09	16	9	4	6	-	-	3.43	2.99	3.26
09/10	8	8	4	-	-	-	3.31	3.28	3.19
Ave.	11	8	6				3.33	3.32	3.32

Year	GRE: Verbal			GRE: Quantitative			GRE: Verbal + Quant		
	BIOL	CHEM	MAAP	BIOL	CHEM	MAAP	BIOL	CHEM	MAAP
03/04	536	424	540	610	581	667	1146	1006	1207
04/05	491	475	460	623	633	653	1114	1108	1113
05/06	525	481	462	582	588	690	1107	1070	1152
06/07	500	540	420	605	583	685	1105	1123	1105
07/08	492	450	417	531	594	628	1024	1044	1045
08/09	481	438	500	610	599	710	1098	1037	1210
09/10	538	502	465	646	620	650	1184	1122	1115
Ave.	509	473	466	602	600	669	1111	1073	1135

Year	GRE: Analytical			GRE: Writing		
	BIOL	CHEM	MAAP	BIOL	CHEM	MAAP
03/04	460	510	470	-	-	-
04/05	555	-	-	-	4.50	-
05/06	-	560	-	-	4.50	5.00
06/07	-	-	-	3.90	4.50	4.50
07/08	-	490	-	4.38	3.40	3.75
08/09	-	-	-	4.00	3.67	4.17
09/10	-	-	-	4.44	4.00	3.88
Ave.	508	520	470	4.18	4.09	4.26

E.3 Financial support for graduate students

The following table lists the funding provided to graduate students enrolled in the most recent academic year in the form of teaching assistantships, research assistantships, and in- and out-of-state tuition waivers. Carnegie peers are presented for comparison. A question mark indicates that the data was unavailable.

Institution	**FT stud.**	**assistant-ships**	**TA ($)**	**RA ($)**	**Summer support**	**in-state waiver**	**out-of-state waiver**
California State University, Fresno	21	?	10,000	?	?	?	?
Eastern Illinois University	12	4	8,100	?	?	?	?
Murray State University	23	4	7,000	?	?	none	yes
Pittsburg State University	10	?	5,000	?	?	full	?
Sam Houston State University	9	?	13,000	?	2,500	full	full
SE Missouri State University	20	21	7,600	?	?	full	?
SUNY Oswego	10	10	11,000	?	available	partial	yes
Western Illinois University	39	18	9,540	8,280	yes	yes	yes
WCU	13	8	10,500	none	none	none	2

The following table lists financial support provided to graduate students for the previous five years. Teaching assistantships come from either the Graduate School or the College of Arts and Sciences. A value in parentheses indicates how many of the allocated stipends were actually used. All stipends are valued at $10,500.

Year	Assistantships			Tuition Waivers	
	Grad School	College	Total	In-State	Out-of-State
2006/2007	13	0	13	5	3
2007/2008	11	0	11	3	3
2008/2009	11	2	13	1	1
2009/2010	11	2	13	1	2
2010/2011	11 (9)	2	13	1	2
2011/2012	9 (8)	0	9	0	2

E.4 Entry requirements for admission to the programs

Entry requirements for the BS program are consistent with the general requirements for the university. These include minimum grade requirements established by the UNC Board of Governors, competitive grades and class rank, SAT or ACT I scores. Detailed requirements are described at `http://www.wcu.edu/28931.asp`.

Entry requirements for the MS program are consistent with the general requirements for the university. These include a 3.0 or higher grade-point average from an accredited undergraduate institution, acceptable scores on the Graduate Record Examination (GRE) and 2-3 positive recommendation letters. Detailed requirements are described at `http://www.wcu.edu/244.asp`.

E.5 Enrollment in research courses

Course[a]	Sum09	F09	S10	Sum10	F10	S11	Sum11	F11	S12
CHEM 380	0	19	11	4	17	26	8	27	27
CHEM 698	1	19	22	4	15	17	2	19	15
CHEM 699	0	1	5	0	3	1	1	0	3
CHEM 799	1	3	3	2	3	2	0	1	0

[a] CHEM 380 = Research for Undergraduates; CHEM 698 = Research in Chemistry (for graduate students); CHEM 699 = Thesis; CHEM 799 = Continuing Thesis

E.6 Enrollment in minors and concentrations for the previous three years

Number of entering students in each concentration

Concentration				
Old Curriculum	**2008/2009**	**2009/2010**	**2010/2011**	**2011/2012**
ACS	-	6	2	-
Biotechnology	2	1	8	-
Environmental	-	4	2	-
Four Plus One	-	1	-	-
Industrial	-	4	-	-
Premed/Prevet/Predent/Preopt	7	16	23	-
Traditional	2	1	4	-
New Curriculum				
ACS	-	-	-	2
Four Plus One	-	-	-	1
General	-	-	-	9
Premed/Biomedical Science and Technology	-	-	-	19
None Declared	6	1	1	3
Total	17	34	40	34

Number of graduating students in each concentration

Concentration	**2009/2010**	**2010/2011**
ACS	4	6
Biotechnology	1	1
Environmental	2	3
Four Plus One	1	1
Industrial	1	-
Premed/Prevet/Predent/Preopt	1	5
Traditional	1	1
Total	11	17

Number of students enrolled in chemistry as a minor

2008/2009	**2009/2010**	**2010/2011**	**2011/2012**
39	59	60	67

E.7 List of student research projects and attendance at conferences for the previous three years

Research projects of undergraduate students

Student	Semester(s)	Research Project
Instructor: Atterholt, Cynthia		
Bell, Jeremiah	F'09	Preparing various aqueous wax emulsions and measuring the viscosity of the mixtures
Burrus, Samuel	F'11	Determining the rheological properties of aqueous pheromone wax emulsions
Garrett, Sara	F'09	Measuring pheromone release rates from flow cells
Gendusa, Vincent	F'10	Installing wet deposition Hg, SO_2, O_3, NO_x and particulate monitors
Harris, Latoya	F'10 - S'11	Preparing pheromone wax emulsions and determining the release rates
Hines, Justin	S'11	Phenylboronate polymers
Instructor: Bonds, Wesley		
O'vil, Yotam	S'09	Printing DNA Microarrays
Instructor: Butcher, David		
Summerlin, Wesley	F'11	Determination of aluminum, calcium, and magnesium in Canadian hemlock foliage and surrounding soil
Wilson, Lucas	S'09	Determination of aluminum, calcium, and magnesium in Fraser fir foliage and surrounding soil
Instructor: Clement, Jason		
Bleich, Rachel	F'09 - SF'11	Scale-up of cultures of *Kitosatospora* for production of antimicrobial compounds.
Campbell, Hailey	F'09	Cytotoxic compounds from *Arnoglossum atriplicifolium*
Farquharson, Aimee	Sum'10	Synthesis of *N*-formyl kynuramine from tryptamine
Falukner, Stefan	F'11	Variation in alkaloid concentrations in wild populations of *Hydrastis canadensis*
Milam, David	S'11	Detection of 1-phenazine carboxylic acid produced by a bacterial strain of genus *Pseudomonas* from the GSMNP
Naylor, Kristin	F'10 - F'11	Isolation of ent-kaurenoic acid from *Aralia racemosa*
Willis, Timothy	S'09	Cytotoxic compounds from *Aralia racemosa*

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Student	Semester(s)	Research Project
Instructor: De Silva, Channa		
Branon, Tess	F'11	Synthesis of melanocortin stimulating hormone (MSH) peptide ligands for biomedical imaging of melanoma cancer cells
Cole, Amber	F'11	Design of highly luminescent lanthanide cluster complexes based on β-diketonate ligands
Dougherty, Alexandra	F'11	Development of luminescent lanthanide β-diketonate complexes with 2,4,6-tri(2-pyridyl)-1,3,5-triazine ligand for potential biological imaging
Runken, Lauren	S'11 - F'11	Computational studies of molecular geometry and electronic properties of terbium β-diketonate complexes
Instructor: DeWald, Laura		
Merchant, Hubert	F'09	Evaluating the effect of nitrogen limited conditions on lipid content and productivity in outdoor cultures of *Nannochloropsis oculata*
Instructor: Dinkelmeyer, Brian		
Brooks, Kevin	F'09	Co-crystallization of mucconic acid derivatives
Burton, William	S'11 - F'11	Synthesis of phenanthroline ligands for inner transition metal coordination
Duncan, Andrew	S'09	Kinetic Determiniation of cis-trans isomerization via IR spectroscopy in mucconic acid co-crystals
Killen, Christopher	S'09	Synthesis of maleic and fumaric acid amide derivatives and their supramolecular chemistry
Mashburn, Patricia	S'10 - Sum'10 & S'11	Synthesis of fulgenic acid
O'vil, Yotam	F'11	Synthesis and supramolecular behavior of benzylidenebarbituric acid
Sneed, Brian	S'09 - F'09	Synthesis of helical polypyrroles
Wilson, Terryol	S'09	Displacement reactions of amine-boroxine complexes
Instructor: Evanoff, David		
Bush, Jacklyn	S'09 - S'10	Preliminary investigations of surface enhanced fluorescence of poly(3-hexylthiophene) & Synthesis and characterization of coated silver nanoparticles
Cook, James	Sum'11 - F'11	Synthesis and characterization of silver nanoshells
Cooke, Kristin	Sum'11 - F'11	Validation of a Raman microscope for surface enhanced Raman spectroscopy
Hollar, Ashley	Sum'11	Fabrication and validation of a scattering spectrometer for metal nanoparticle characterization
Instructor: Foley, Patricia		
Moline, James	F'11	DNA analysis reveals misdiagnosis of dizygotic twins

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Student	Semester(s)	Research Project
Instructor: Huffman, Carmen		
Overstreet, Richard	F'10 - F'11	Computational and thermal analysis of boroxine and crown ether complexes
Smithey, Sarah	Sum'11 - F'11	Analysis of metal ion binding to metal oxide substrates
Spear, Jessica	F'09 - S'10	Adsorption of cetylpyridinium chloride to silica surface in the presence of surfactants that form admicelles
Williams, Melissa	F'10 - S'11	Mass spectrometry of crown ether complexes
Instructor: Huffman, Scott		
Beeker, Kristin	S'09 & S'11	Modification of silica and metal oxide surfaces and boron-nitrogen complexes and characterization with vibrational spectroscopy
Harper, Stephanie	S'09	Quantum mechanical modeling of boron-nitrogen complexes
Jones, Tyler	S'09	Modification of silica and metal oxide surfaces and boron-nitrogen complexes and characterization with vibrational spectroscopy
Leenders, Renske	F'09	Authentication of cremation remains using infrared spectroscopy and chemometrics
Minten, Johanna	F'09	Evaluation of methods for the extraction of human DNA from difficult substrates including hair, bones and teeth
Palmer, Jessica	S'09	Development of a chemometric mixture analysis algorithm
Perry, Lindsey	F'10 - S'11	Vibrational spectroscopic library building of materials used in cultural, historic objects
Spear, Jessica	S'09	Authentication of cremation remains using infrared spectroscopy and chemometrics
Sprague, Stacey	F'11	Vibrational spectroscopic library building of materials used in cultural, historic objects
Williams, Caitlin	Sum'10 - S'11	Development of a chemometric mixture analysis algorithm & Vibrational spectroscopic library building of materials used in cultural, historic objects

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Student	Semester(s)	Research Project
Instructor: Kwochka, William		
Bazinet, Christine	S'10 - S'11	Preparation of covalent organic frameworks from boronic acids
Harper, Stephanie	S'09	Formation of dative bonds using boronic acid derivatives and Lewis bases
Hawkins, Heather	S'10 - F'10	Displacement reactions of amine-phenylboronate complexes
Hines, Justin	S'10 - S'11	Phenylboronate polymers
Jones, Tyler	S'10	Displacement reactions of amine-boroxine complexes
Lux, Jeffrey	S'09 - F'10	Amine complexes of borinic acids and 9-BBN
McNeely, Barry	S'09	Preparation of hydroxy dimethyl isophthalic acid
Price, Charles	F'10 - F'11	Boron-containing rotaxanes
Rizzo, Natalie	F'10 - S'11	Boronate-Lewis base polymers
Wilcox, Nicholas	F'11	Boron-containing molecular rotor
Wilson, Terryol	S'09	Displacement reactions of amine-boroxine complexes
Instructor: Salido, Arthur		
Burke, Harrison	F'09 - S'10	Comparison of ICPOES soil analysis with tungsten coil atomic emission analysis.
Jones, Collin	F'09	Development of solid phase extraction methods to extract Sr from soil
Richardson, Joseph	F'11	Development of a tungsten coil mass spectrometer
Instructor: Summers, Jack		
Barborich, Sherri	Sum'11 - F'11	Electrochemistry of iron complexes
Fries, Lesley	F'10	Inhibition of superoxide dismutase enzymes
Fulle, Kyle	S'11 - F'11	Development of a microcontroller based potentiostat
Hickman, Benjamin	F'10 - F'11	Mechanistic studies of superoxide dismutase inhibition
Hopkins, Virginia	S'11	Superoxide dismutase inhibition
Johnson, Kandyce	S'11	Superoxide dismutase inhibition
Parris, Jessica	F'09	Superoxide dismutase inhibition by flavonoids
Sprague, Stacey	S'11 - F'11	Synthesis of 2-succinyl cysteine derivatives
Wilson, Brandon	S'11	Superoxide dismutase inhibition
Instructor: Van Dyke, Michael		
Bell, Jeremiah	S'11	Explorations in molecular biology
Collins, Kirsten	F'11	Optimizing expression of recombinant PhoA(del1-21)
Denning, Catherine	F'10 - F'11	Structural studies of the stress-response translation regulator Stm1p

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Student	Semester(s)	Research Project
Instructor: Wilson, Mark		
Dyer, Richard	F'09	Sequencing of mitochondrial DNA from human samples
Harris, Monesha	S'11	Evaluation of serological techniques for bloodstain analysis
Leenders, Renske	F'09	Optimization of DNA extraction protocols from forensic samples such as bones and teeth
Minten, Johanna	F'09	Optimization of DNA extraction protocols from forensic samples such as bones and teeth

Student presentations at conferences

Student	Year	Conference
Harper, Stephanie L.	2008	Southeast Regional Meeting of the ACS
Bleich, Rachel M.	2010	WCU Undergraduate Expo
Bush, Jacklyn C.	2010	Pittcon
Leenders, Renske	2010	Pittcon
Williams, Caitlin	2010	Federation of Analytical Chemistry and Spectroscopy Societies Conference
Bleich, Rachel M.	2011	Southeast Regional Undergraduate Research Conference
Bleich, Rachel M.	2011	Science in the Mountains
Bleich, Rachel M.	2011	WCU Undergraduate Expo
Naylor, Kristin M.	2011	Science in the Mountains
Cook, James P.	2012	Pittcon

Graduate student projects and theses

Student	Status[a]	Project or Thesis
Instructor: Atterholt, Cynthia		
Ballew, Stephen	MS: 2011	Rheological characteristics of aqueous wax emulsions used for the controlled release of pheromones as an alternative to the use of pesticides for insect pest management
Davis, Paul	MS: 2008	The release rates of pheromones from paraffin emulsions : implications for codling moth control in integrated pest management systems
Walsh, Jesse	MS: 2008	Sequencing and analysis of genes expressed in the cambial tissue of *Quercus rubra* using a normalized, large-insert cDNA library
Instructor: Bonds, Wesley		
Zalevskiy, Sergey	MAT: 2010	Developing microarray kits for teaching genetics
Instructor: Butcher, David		
Park, Sung-Gun	MS: 2009	Investigation of the interaction between arsenic species and thiol compounds via ESI tandem mass spectrometry
Rosenberg, Matthew	MS: 2010	Determination of calcium, magnesium, and aluminum in red spruce (*Picea rubens*) foliage and surrounding soil from the Great Smoky Mountains National Park, Blue Ridge Parkway, and Mount Mitchell State Park using inductively coupled plasma optical emission spectrometry
Wilson, Lucas	MS: 2010	Determination of calcium, magnesium, and aluminum in Fraser fir (*Abies fraseri*) foliage and surrounding soil in the Great Smoky Mountains, Balsam Mountains, and Black Mountains using inductively-coupled plasma optical emission spectroscopy
Instructor: Clement, Jason		
Appiah, Alfred	Non-matriculating	Phytochemical analysis of *Croton membranaceus*
Flood, Matthew	MS: 2010	Anti-tumor natural product research focused on plants found in the southern Appalachian region
Looney, Patrick	In progress	Variation of triterpenoid saponin and phenolic acid concentrations in black cohosh (*Actaea racemosa*) from across its native range
Willis, Timothy	In progress	Sesquiterpenoids from late boneset (*Eupatorium serotinum*)

[a] DNC = did not complete

Student	Status	Project or Thesis
Instructor: De Silva, Channa		
Attanayake, Gayanthi	In progress	Development of water-soluble lanthanide-doped up-converting nanoparticles for bio-medical imaging
Martin, Louis	In progress	Development of novel lanthanide complexes and their nanoparticles based on the 4,4,4-trifluoro-1-phenyl-1,3-butanedione and 4,7-dimethyl,1,10-phenanthroline ligand system for biological imaging
Instructor: Dewanti, Asteriani		
Hunter, Alisha	DNC	Glucose oxidizing sugars
Instructor: Dinkelmeyer, Brian		
Beard, Kyle	MS: 2008	Crystal engineering : solid state reactivity of butadiene monomers in crystals
Duncan, Andrew	DNC	Solid-state chemistry of fumaramide derivatives
Jones, Collin	DNC	Synthesis, supramolecular chemistry and solid-state reactivity of fulgenic Acid
Roberts, Isaac	DNC	unknown (instructor no longer here)
Steddum, Christopher	In progress	Method development for the kinetic study of topochemical 1,4-polymerizations
Weathersby, Shana	MS: 2010	[2+2] dimerization of cinnamylidenemalonic acid
Young, Michael	MS: 2008	1,4-topochemical polymerization of 1,3-butadiene derivatives
Instructor: Evanoff, David		
Bush, Jacklyn	In progress	Plasmonic fluorescence enhancement of poly(3-hexylthiophene) for organic solar cell applications
Coppolo, John	DNC	Synthesis and characterization of silver core-dielectric spacer-metal shell nanoparticles and their application to surface enhanced spectroscopy
Hakat, Yasemin	DNC	Synthesis and optical properties of coupled plasmonic nanostructures
Instructor: Huffman, Carmen		
Benoist, D. Michelle	MS: 2008	Investigations of the noncovalent bond in macrocycle/protonated primary amine complexes
Blumsack, Katie	DNC	Effects of ionic strength and salt identity on lipid monolayer formation at the air/water interface
Brooks, William	MAEd: 2008	Development of chemical demonstration kits for teaching undergraduate chemistry
Instructor: Huffman, Scott		
Gonzalez, Malia	MS: 2008	Fluorescence quenching capabilities of cadaverine

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Student	Status	Project or Thesis
Instructor: Kwochka, William		
Budhathoki-Uprety, Januka	MS: 2008	Synthesis of a mechanically interlocking auxiliary to prepare non-conventional rotaxane
Hart, Matthew	MS: 2010	(2)Rotaxanes as reagents for (3)rotaxane synthesis [i.e. synthesis]
Lux, Jeffrey	In progress	Dative bond formation in borinic acid complexes
Rizzo, Natalie	In progress	Polymeric assemblies of Lewis base - phenyl boronate complexes
Uprety, Rajendra	MS: 2008	Synthesis of precursors for impossible rotaxane
Wilson, Terryol	MS: 2011	Displacement reactions and fluorescence studies of boroxine amine complexes
Instructor: Miller, Jerry		
Wilson, Leslie	MS: 2011	Determination of trace element provenance, Rio Loa Basin, northern Chile
Instructor: Salido, Arthur		
Lawrence, Kelly	MS: 2008	The development of sample pre-treatment and extraction methods for the detection of cobalt in soil using a tungsten (W)-coil atomic emission spectrometer (AES)
Instructor: Summers, Jack		
Arrington, Megan	MS: 2010	Superoxide dismutase inhibitor screening and characterization using p19sF NMR
Hickman, Benjamin	In progress	Metal binding behaviors of succinate modified cysteine and glutathione
Markley, Jonathan	MS: 2010	Characterization of inhibitors for Cu/Zn superoxide dismutase observed by p19sF NMR methods
Moore, Michael	DNC	Inhibition of superoxide dismutase
Instructor: Wilson, Mark		
Hill, Madeline	DNC	Validation of the Applied Biosystems 3130XL DNA sequencer
Lefler, Ashley	In progress	Human short tandem repeat DNA mixture analysis: Comparison and application of software packages

E.8 Student transcripts

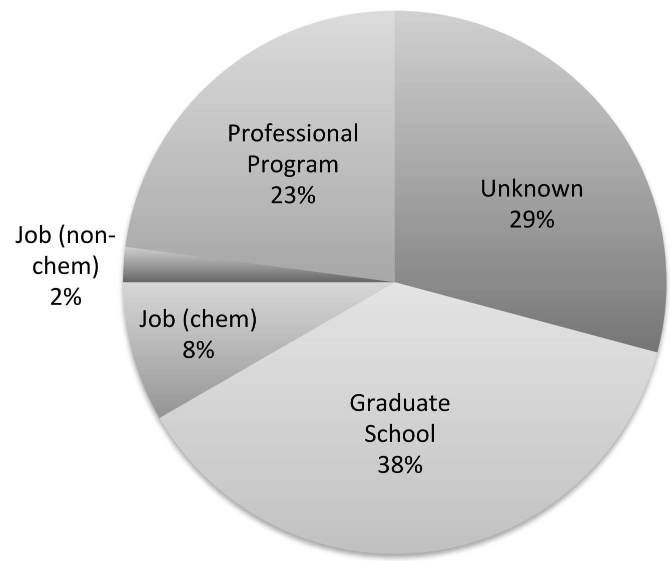
Student transcripts may be made available upon request.

E.9 Student advising files

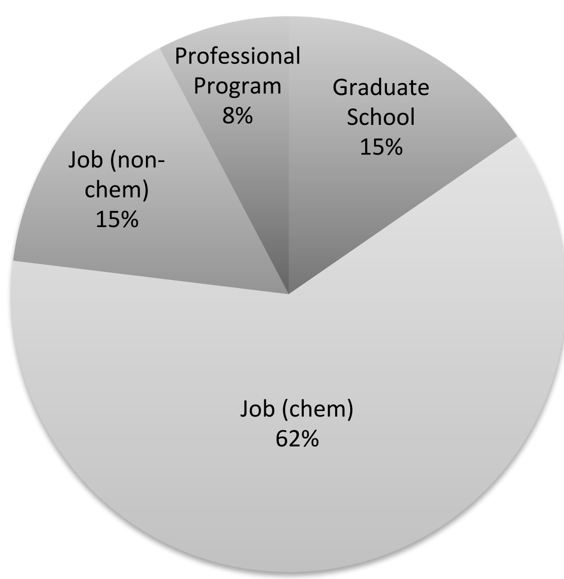
Student advising files may be made available upon request.

E.10 Employment positions and graduate studies pursued by recent graduates for the previous three years

Undergraduate students



Graduate students



E.11 Exit interviews of graduating seniors

Department of Chemistry & Physics
College of Arts & Sciences
Western Carolina University

Exit Interview of Graduating Chemistry Majors

Student being interviewed:**two students** Date of interview: **December 2010**

Person conducting interview: **Dr. William R. Kwochka**

Each semester one member of the faculty in the Department of Chemistry & Physics will conduct exit interviews of graduating senior chemistry majors in order to assess the department's ability to provide opportunities to our students.

1. What is your chemistry major concentration?
   - ACS, two students
   -
2. When did you begin your chemistry major here at WCU?
   - Fall 2007 and fall 2008
   -
3. What were your **most valuable experiences** during your time in the chemistry program? Please comment on the program in general, courses you took, faculty, and facilities.
   - Getting to do research
   - Getting to know professors
   - Good preparation for training on instrumentation – can go on to further work
   - Enjoyed the challenge of tutoring students in introductory courses
   - Enjoyed the accessibility to faculty; definite benefit to a smaller school

4. What were your **least valuable experiences** during your time in the chemistry program? Please comment on the program in general, courses you took, faculty you worked with, and facilities that you used.
   - Disliked book rental system
   - Disliked the overlap that several courses in the department have

5. Did you work on an undergraduate research project? How long of a time period and with whom? What worked best and what didn't work so well in that project?
   - Yes, two semesters in physics. This experience established an interest to pursue topics in a graduate program. Liked working with faculty; disliked no having enough time.
   - Yes, two semesters in chemistry. Everything worked out well in the lab. Liked working in the lab; disliked not making a more informed choice and wanted more guidance in the lab.

6. How well prepared do you think that you are for a career in chemistry or further studies in chemistry?
   - Well prepared in chemistry but there were holes in my chemistry education. Critical thinking was not emphasized in some classes, just regurgitation.
   - Well prepared in terms of good lab experience and good instrumentation experience.

7. What are your plans after graduation?
   - Take a semester off and apply for a job.
   - Work for a while then begin grad school.

8. What would you like to see changed about the program? What would you like to keep the same?

   Change
   - Would like to have opportunities beyond the department (REU summer research, go to conferences, etc…)
   - Would like to hear about faculty research topics – similar to format used for grad student presentations
   - Would like to have more guidance about career paths – market this aspect of the education more
   - Remove redundant aspects of the curriculum
   - Incorporate research projects into lab courses
   - Get to new topics earlier in the curriculum (include hot new areas of chemistry)
   - Get into more detail on only a few topics in a course rather than do a little of everything.

   Retain
   - Students liked getting experience using instrumentation.

9. Is there anything else that you would like to add?
   - One interviewee had some advice to impart to students:
     - Research prepares you for work in a lab
     - Develop a network of faculty in addition to your advisor.

Revised WRK: 12/14/2010

Department of Chemistry & Physics
College of Arts & Sciences
Western Carolina University

Exit Interview of Graduating Chemistry Majors

Student being interviewed: **several graduating seniors** Date of interview: **May 2011**

Person conducting interview: **Dr. William R. Kwochka**

Each semester one member of the faculty in the Department of Chemistry & Physics will conduct exit interviews of graduating senior chemistry majors in order to assess the department's ability to provide opportunities to our students. Comments below are from individual students unless otherwise indicated.

1. What is your chemistry major concentration?

   Of the 16 graduating seniors, I interviewed 10 students. Five students were ACS-approved and five students were pre-professional.

2. When did you begin your chemistry major here at WCU?

   Start dates ranged anywhere from fall 2004 to spring 2009 (several transfer students)

3. What were your **most valuable experiences** during your time in the chemistry program? Please comment on the program in general, courses you took, faculty, and facilities.

• Liked hands-on experiences	• PChem 2 writing project was extremely useful	• Liked helpfulness of faculty (5 students)
• Wrote SOPs in instrumental	• Liked the technique/instrument training	•
• Liked oral exams	• Liked small class sizes; could form study groups	•
• Research, everyone should have this experience	• Liked POGIL a lot (4 students)	•

4. What were your **least valuable experiences** during your time in the chemistry program? Please comment on the program in general, courses you took, faculty you worked with, and facilities that you used.

• POGIL; needed a stronger math background and wanted more structure (2 students)
• Biochem with biology faculty was not very useful (2 students)
• Course schedule for transfer students caused problems (several students)
•

5. Did you work on an undergraduate research project? How long of a time period and with whom? What worked best and what didn't work so well in that project?

   All students interviewed worked on undergraduate research projects ranging in time periods from two semesters to three semesters plus a summer. Most students really liked the independent nature of the projects and that they were doing something new that no one else was doing. However, most students also liked the social aspects of the research within a group and which made them feel part of a community. One student especially disliked research because it was not "social enough".

6. How well prepared do you think that you are for a career in chemistry or further studies in chemistry?

   Most felt well-prepared for career in chemistry and had a good overall knowledge of chemistry. Appreciated all the hands-on experience gained with instrumentation.

7. What are your plans after graduation?

MS in chemistry at WCU (3 students)	PhD program at SUNY Albany	Pharmacy program at Medical U of SC
Job (4 students)	Pharmacy program at UNC-Asheville	

8. What would you like to see changed about the program? What would you like to keep the same?

Change	Keep the same
Have faculty present research projects to undergrads at the beginning of fall semester	Keep hands-on experiences for instrumentation
Need calc 3 for PChem	More help with writing resumes, cover letters, and job search
More field trips (the body farm)	

Increase number of oral exams	
For instrumental chem course, take lab first then learn about theory	
Have dept. wide mandatory safety training for UG research students	
Several people wouldn't change anything	

9. Is there anything else that you would like to add?

"Overall, a great experience".
"Liked the small classes".
"Thanks to everyone".
"Research is the most important part of the major; it takes everything you've learned and brings it all together".
"I wish that I was more involved in the Chem Club"

E.12 Small group analysis of MS program

Coulter Faculty Center for Excellence in Teaching & Learning

Small Group Analysis Report

Western Carolina University

Instructor: Chemistry MS Program
Course: Chemistry MS Seminar
Date: January 20, 2012

Part One

Transcription of students' comments (8 students present)
SGA by Freya Kinner, Coulter Faculty Commons

1. **What aspects of the coursework in the Chemistry MS program do you feel prepare you to be successful in your future career?**

Presentations

- Presentations improve our presentation ability and also organizing ability.
- The projects/presentations that graduate students are given such as the structure determination project in "Organic Structure Determination" class, the instrumental project in "Instrumental Analysis II," and the research presentations in "Seminar" give me the confidence in my abilities as a chemist and prepare me for the jobs that chemists take in industry.

Learn marketable skills/applied skills

- Before I decided to switch my career goals, the master's program made me very prepared for my career. I learn useful skills that make me marketable to companies.
- In the fall, the Structure Determination class was the most useful course that I have taken. It was more of an application-based class vs. theory.

Learn foundational skills

- I feel that the courses we take and the things we learn in lecture lay the foundation for us in terms of our chemistry knowledge.
- I feel that lab work is what really prepares us for our future work environment. It is important to know the math, principles, and theories that make up chemistry, but without good lab skills, it is almost useless. So, I would say the stuff we learn in the laboratory is what prepares us the most.
- Teaching process/style of experimenting first, then learning mechanisms, then re-experimenting with an understanding of how and why things work as they do.
- Enjoy teaching labs because it makes you learn how to explain your thought process and the knowledge you have gained clearly and effectively.

Learn from labs

- I feel that lab work is what really prepares us for our future work environment. It is important to know the math, principles, and theories that make up chemistry, but without good lab skills, it is almost useless. So, I would say the stuff we learn in the laboratory is what prepares us the most.

1

- Enjoy teaching labs because it makes you learn how to explain your thought process and the knowledge you have gained clearly and effectively.
- The labs

Instrumentation
- Hands on experience with instruments
- The projects/presentations that graduate students are given such as the structure determination project in "Organic Structure Determination" class, the instrumental project in "Instrumental Analysis II," and the research presentations in "Seminar" give me the confidence in my abilities as a chemist and prepare me for the jobs that chemists take in industry.

Course content
- Good range of subjects
- Depth discussed in special topics classes is very useful

Class size/relationships
- The smaller class sizes which allow you to have a more one-on-one relationship with the instructors.
- I really like the program, but what I like better are the people who are involved, both other grad students and faculty

2. **How could the courses you have been offered in the Chemistry MS program be improved to better prepare you for your future career? Please offer suggestions for improvement.**

New technologies and instrumentation
- If these courses are more related to new technology it will be a great benefit for our future careers.
- I would like to spend more time operating instruments that are commonly used in industry and more time learning about the cutting edge techniques for chemical analysis that are currently being employed in the chemical industry.
- I think, if the courses in the MS program are more related to new technology and nanotechnology, students will have more interest about this program.

More graduate courses needed
- Could offer more courses
- Need more classes. Western Chemistry, I feel, is catering to all of the other undergrad courses for other majors. We have a very talented faculty here at WCU. I could learn a lot from them if we could offer more classes to the course. This would only be possible if our professors could teach more topics classes and less lower level chemistry courses.
- Less combined courses with undergrads would eliminate possible "review" time and allow time to go into deeper subjects

Greater instructor professionalism/preparation
- One class I took, the professor was very unprepared for the class and made for a bad experience.

- I like that we have a somewhat laid back approach in terms of how we interact with our professors, but within a classroom setting, I think professionalism is important.

Course content and teaching techniques
- Theory is good to know, but Inorganic will not help me with my career.
- I think it would be good to be able to focus either on organic or inorganic chemistry and obtain more in depth knowledge of one aspect in chemistry rather than just general knowledge of both.
- Could have more visual examples or models available during classes or in lab setting (ex: large sized model kits in labs)

3. **What aspects of your research experiences in the Chemistry MS program do you feel prepare you to be successful in your future career?**

Hands-on learning
- Hands-on experience
- Hands-on lab work

Gained marketable skills
- Learning about instruments is a good experience to our industrial applications. Because most of the jobs are oriented around instrument analysis and analytical base environment, so if we can get more experience of handling the instruments during our research program, it will be a great thing to our future career.
- As much as I hate it at times, it is very rewarding when things go right and get good results. My research has prepared me for a good career. My skill set that I learned while at WCU has made me very marketable to companies. Not everyone can do the research I do.

Gained transferable/"soft" skills
- I get the opportunity to bring my own ideas to the table and do a lot of troubleshooting. I think that is really important.
- I get experience collaborating with others, and I think that is important in terms of developing people skills.
- I think it's a good experience in terms of learning responsibility and time management skills.
- Independent thought required
- Being accountable
- Being able to brainstorm with other grad students has helped me solve many problems

Learned presentation skills
- TRAC meetings and presentations
- Opportunities to publish work and attend conferences are good preparation for my career.

Learned instrumentation/lab skills
- I've gotten a lot more comfortable using various instruments, which is very important.

- The precision and care which is required of a chemistry graduate student to achieve good results in lab are important for making me a competitive candidate for positions in industry as well as other professional programs.

4. How could the research experiences you have been offered in the Chemistry MS program be improved to better prepare you for your future career? Please offer suggestions for improvement.

Instrumentation/funding
- Access to better instrumentation would improve the quality of research I could produce.
- If the chem. department had more money and better equipment, we could compete with larger universities. There are things we can do and there are things we can not do at Western.
- If there are more instruments in the department, it will be great for the characterization of the final product.
- Better equipment
- The department is underfunded. Most majors on campus require their students to take some form of Chem.

Organization/planning
- More organization and order.
- I would like a more rigid schedule – like a real job. As it is now, I get things done, but I go to work when I feel like it. I feel if it was a little more structured, I would reach my full potential and utilize my time in a more appropriate manner.
- Planning out research goals more in advance

5. How did you hear about the MS program?

Former WCU undergrad
- Undergrad here and MS was the next step
- I was getting my BS in Chemistry here and professors told me about the MS

From students/faculty
- From students/faculty
- Drs. Huffman and Dinkelmeyer
- A teacher

Other
- I searched school websites for Chemistry MS programs.

6. Any other comments?
- Very happy with the program overall

Part Two

While one student discovered the Chemistry MS degree at WCU through a web-search, most heard about the program through their undergraduate experience Western and from students and faculty members.

Coursework

Chemistry MS students feel that their coursework is helping them prepare for future careers. In particular, students cite that their courses allow them to learn marketable, applied, and foundational skills. Students feel that course content is appropriate and useful, and they recognize that the associated labs are key for career preparation. SGA participants find that experience with presentations and working with lab equipment and instruments are vital skills for their futures. In addition to the skills and knowledge gained through the MS program courses, students agree that the people and small class sizes contribute to their development.

While, overall, students are content with their graduate student course experience, they feel that new technologies and instrumentation would assist in their growth. An expansion of graduate course choices would likewise contribute to the value of graduate coursework. While this is not a common suggestion, some students explain that greater instructor professionalism and preparation would improve graduate-level classes.

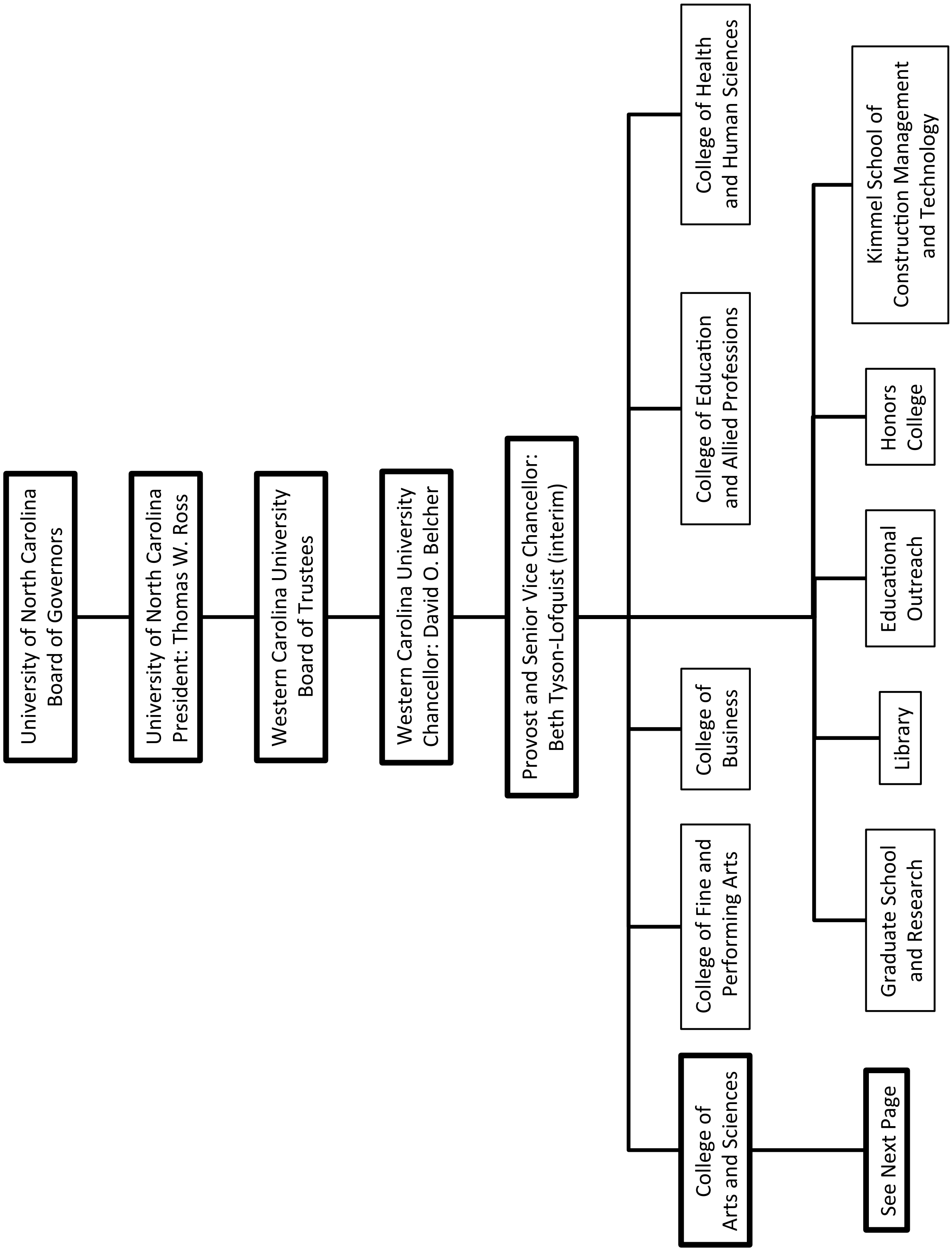
Research

In addition to their gains through coursework, Chemistry MS students feel that they have grown in their transferable or “soft” skills through participating in research. For example, students recognize that research increases their collaboration/teamwork skills, personal responsibility, and independent thinking. In addition to these “soft” skills, students believe that their WCU research experience has helped them gain other marketable proficiencies through presentations, conferences, and instrument and laboratory experience. Other students describe that research allows them to have “hands-on” learning experiences.

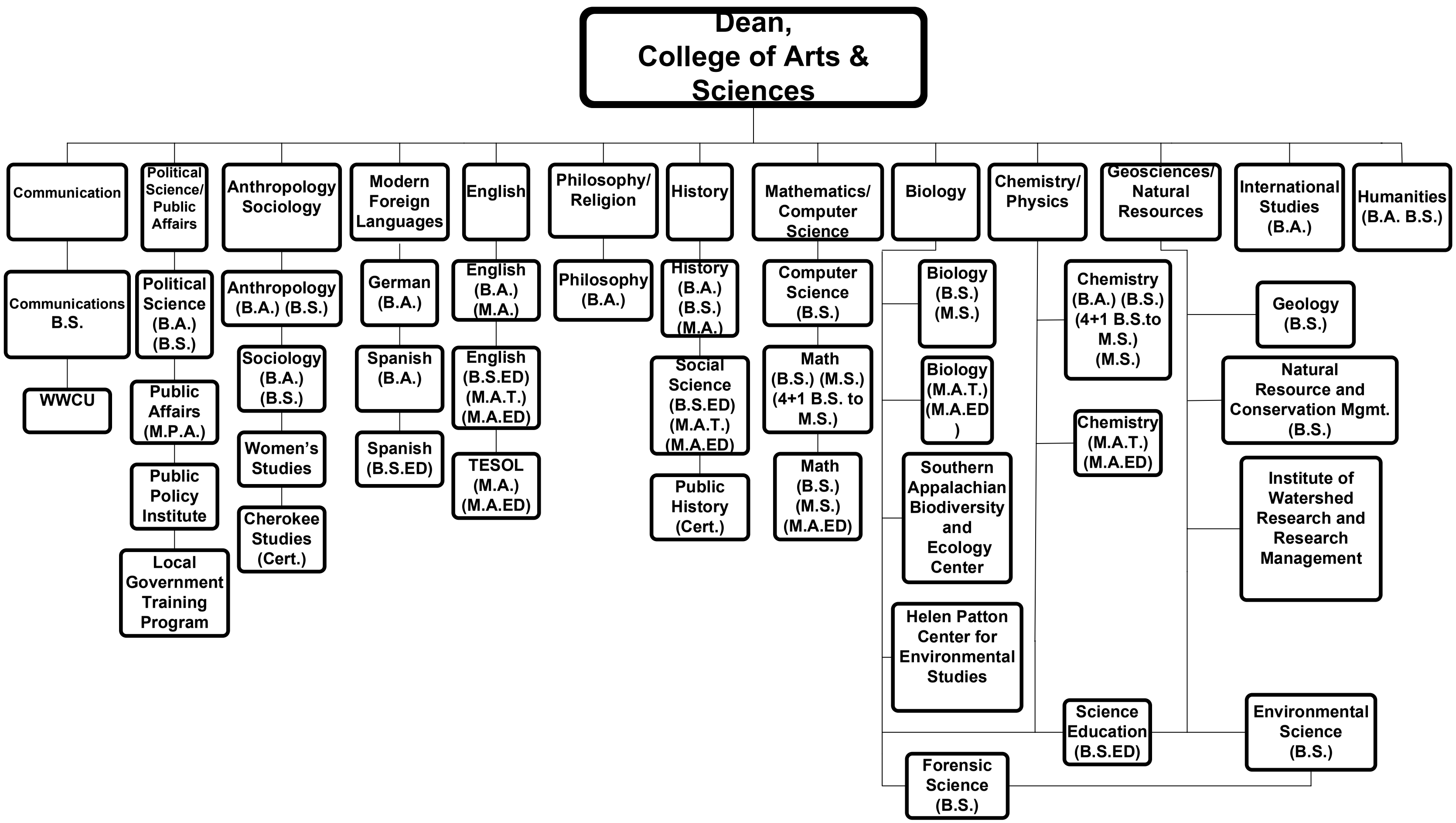
While research is an overwhelmingly positive experience for Chemistry MS students, participants feel that the department is “underfunded” and needs updated instruments. Other students suggest that an improvement in research organization and planning would improve their career preparation.

F Documentation for Standard 6

F.1 Organizational charts



College of Arts & Sciences



F.2 Minutes of departmental meetings

Minutes of departmental meetings may be made available upon request.

G Documentation for Standard 7

G.1 Equipment, travel, technology and operating budgets for the previous three years

Account[a]	**Type**	**Adjusted Budget ($)**		
		2009	**2010**	**2011**
101760-2000BP	Purchased Services Pool	16,541	13,832	15,101
101760-2100BP	Purchased Contract Services	112	50	211
101760-3000BP	Supplies Pool	35,440	41,140	35,440
101760-4000BP	Property, Plant and Equipment	9,175	8,997	9,175
101760-5000BP	Other Expenses	650	712	551
101760	Subtotal	61,918	64,731	60,478
101002-2000BP	Purchased Services Pool	74	717	-
101002-2100BP	Purchased Contract Services	-	510	500
101002-3000BP	Supplies Pool	27,033	18,313	29,340
101002-4000BP	Property, Plant and Equipment	4,534	12,101	1,801
101002-5000BP	Other Expenses	-	-	-
101002	Subtotal	31,567	31,641	31,641
102760-2000BP	Purchased Services Pool	-	3,179	8,575
102760-2100BP	Purchased Contract Services	-	-	-
102760-3000BP	Supplies Pool	-	3,360	-
102760-4000BP	Property, Plant and Equipment	-	-	-
102760-5000BP	Other Expenses	-	-	-
102760	Subtotal	-	6,539	8,575
	TOTAL	93,485	102,911	100,694

[a]See explanation of budget codes below.

Explanation of budget codes

The first part of the code indicates the main funding source as follows:

- 101760 = departmental budget
- 101002 = Education and Technology (E & T) budget
- 102760 = summer school budget (note that this budget was first available in 2010)

The second part of the code indicates the type of purchase split into the following subcategories:

- 2100BP = contract food service, other contracted service, miscellaneous contractual service, repairs (other), maintenance contract equipment, maintenance agreement (other software), out-of-state transportation (air), out-of-country transportation (air), in-state transportation (ground), out-of-state transportation (ground), travel advance, out-of-state transportation (other), in-state lodging, out-of-state lodging, in-state meals, out-of-state meals, in-state travel expenses (other), out-of-state travel expenses (other), telephone services, postage, freight/delivery service, printing and binding, advertising, registration fees, rent/lease other property, PawPrint and copying
- 3000BP = office supplies, janitorial supplies, educational supplies, data processing supplies, security/safety supplies, other administrative supplies, repair supplies, gasoline, motor vehicle supply, clothing and uniforms, laboratory supplies, scientific supplies, carpentry and hardware, food products
- 4000BP = educational equipment, office furniture, classroom/library furniture, office equipment capital, scientific/medical equipment, other departmental equipment, PC and printer purchase, other computer software, PC software purchase
- 5000BP = license and permit costs, membership dues

G.2 List of major facilities and equipment

Major Facilities and Equipment Used by the Program

We have sixteen analytical facilities housed in the Department of Chemistry and Physics, of which six separation systems, three atomic spectrometers, five molecular spectrometers and two miscellaneous analytical devices, are described below.

GC and GC/MS

Gas Chromatography: We have two GC systems. Both are Shimadzu GC -17AAF, one of which is equipped with FID detector and another is equipped with FID and ECD detectors.

Gas Chromatography – Mass Spectrometer: Shimadzu QP5050A equipped with EI & PCI & NCI ionization sources

LC and LC/MS

High Performance Liquid Chromatography (HPLC): Dionex DX500 with GP50 gradient pump and AD20 absorbance detector.

Liquid Chromatography – Mass Spectrometer (LC/MS): Dionex micro. HPLC with Thermo Ion Trap Mass Spectrometer

Ionic Exchange Chromatography (IC): Dionex DX-120 IC with an AS40 autosampler. This device has both cation and anion exchange columns.

Atomic Spectroscopy

Atomic Absorption Spectrometer (AAS): Perkin Elemer's atomic absorption spectrometer AAnalyst 300.

Mercury Analyzer: Perkin Elmer's Flow Injection Mercury/ Hydride Analyses (FIMS)

Inductive Coupled Plasma (ICP): Perkin Elmer's Inductively Coupled Plasma 4100.

Molecular Spectroscopy (I)

Fluorescence Spectroscopy: Perkin Elmer's Fluorescence Spectroscopy LS55

Ultraviolet – Visible Spectroscopy: HP 8453 Ultraviolet – Visible Spectroscopy (UV-Vis)

Molecular Spectroscopy (II)

Fourier Transform Spectrometer (FTIR): Perkin Elmer's FTIR (Spectrum One)

Fourier Transform Spectrometer (FTIR) with Microscopy: Nicolet Avatar FTIR combined with Nicolet Centaurus Microscopy from Thermo Electron Scientific Instrument

Molecular Spectroscopy (III)

Nuclear Magnetic Resonance Spectroscopy: JEOL 300MHZ Eclipse + FT NMR with 5mm FG/TH tunable probe.

Miscellaneous:

Thermal Analytical Device: Perkin Elmer's Thermogravimetry / Differential Scanning Calorimetry (TGA/DSC)

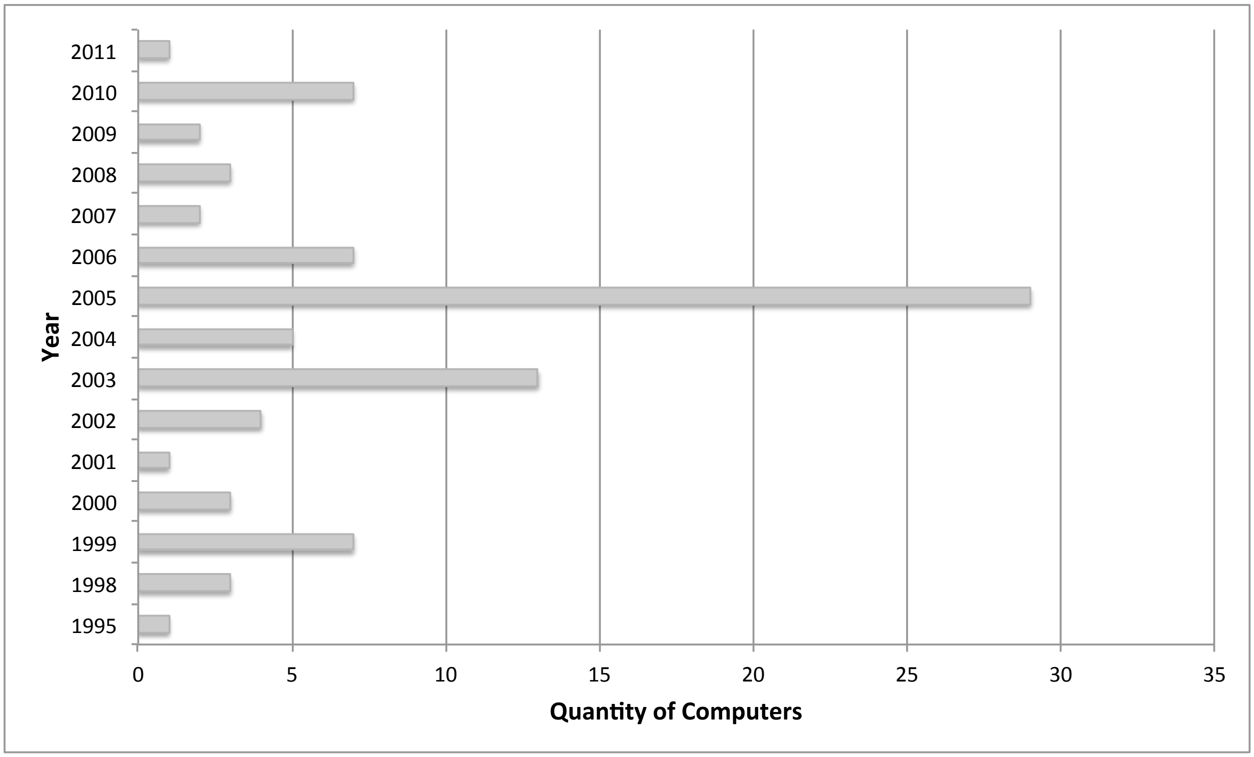
Electroanalytical Device: Voltammetric Analyzer

Langmuir – Blodgett Trough: NIMA Technology's LANGMUIR-BLODGETT TROUGH

G.3 List of major hardware and software used by the programs

Hardware

In our programs, we have 90 computers used as personal office computers (24), teaching workstations (20), research computers (28) and computers used to control instrumentation (18). The computers range widely in age as shown by the distribution below. Seventy-five percent of the computers were purchased before 2006, and some (12%), which are used for instrumentation, were acquired in the late 1990's.



Software

In addition to proprietary software used to run instrumentation listed in Appendix G.2, the programs also utilize proprietary software listed below.

- Spartan (by Wavefunction) - computational software used for research and instruction
- LoggerPro (by Vernier) - data analysis software used for research and instruction
- GeneMapper ID/ID-X (by Applied BioSystems) - used for research and instruction
- GeneMarker (by Soft Genetics) - used primarily for research
- Prism (by GraphPad) - biochemical data analysis software used primarily for research
- Mathematica (by Wolfram) - used primarily for research
- MatLab (by Mathworks) - used primarily for research

- LabView (by National Instruments) - used primarily for research

G.4 Major library resources, databases and journals

Databases

There are ten databases that support chemistry programs. Major databases include: SciFinder Scholar (includes Chemical Abstracts), CHEMNetBASE, Science Citation Index (Web of Science), Applied Science and Technology Abstracts, and Science Reference Center.

Journals

Approximately 550 chemistry-specific journals including all ACS titles and major titles from Elsevier (via ScienceDirect), Wiley, Springer and limited RSC titles. Other major journals covering chemistry topics but not exclusive to chemistry include *Science*, *Nature*, and the *Proceedings of the National Academy of Sciences.*

Monographs

We have just over 4,800 monographs cataloged in the QD section (QD classification by Library of Congress: chemistry) and 950 titles in the TP section (chemical engineering). This is exclusive of holdings that would include chemistry-related topics but not be exclusively chemistry-based. This list also excludes items available from University of North Carolina Asheville and Appalachian State University with whom with have a cooperative borrowing agreement.

Reference Materials

We have standard reference works in print with many also available online. These include the *CRC Handbook of Chemistry and Physics*, the *Merck Index*, *Dictionary of Organic Compounds* (included in CHEMnetBASE), and the *Kirth-Othmer Encyclopedia of Chemical Technology.*

G.5 Support personnel

Individual	**Title**
Bintz, Wesley W.	Research Operations Manager
vacant	Administrative Support Associate
Students (3)	Stockroom Assistant (part-time)