

## **2007 Assessment Report for the Graduate Program in Chemistry at Cleveland State University**

### **INTRODUCTION**

The Chemistry Graduate Program has many components. Students may pursue both the M.S. and Ph.D. degrees, on either a full- or part-time basis. The M.S. degree consists of the traditional master's degree, but a non-traditional "course work" M.S. degree is also offered. The course work master's greatly benefits those students pursuing the degree on a part-time basis. The Department offers the Ph.D. degree in Clinical-Bioanalytical Chemistry. This is a joint program with the Lerner Research Institute of the Cleveland Clinic Foundation. Ph.D. students also have the opportunity to pursue certification in Clinical Chemistry or a specialization in Molecular Medicine, which greatly enhance the student's skills, knowledge, and employability.

### **Faculty Demographics**

There are 14 tenure track faculty in the Department representing five areas of chemistry: Analytical (Bayachou, Guo, Turner, Xu); Clinical (Anderson, Kalafatis, Wei, Zhou); Inorganic (Duraj); Organic (Masnovi, Sun); and Physical (Ball, Gogonea, Ng). Thirty-five researchers from the Lerner Research Institute of the Cleveland Clinic Foundation hold CCF faculty appointments. The Department also has 12 adjunct faculty and nine part-time lecturers.

The chemistry faculty continues the partnerships described in last year's assessment report. The Clinical Chemistry program has a history of extensive collaboration with the Pathology Departments at The Cleveland Clinic Foundation, MetroHealth Medical Center and other local hospitals. Other partnerships include cooperative projects with scientists at the NASA Glenn Research Center, the Ohio Aerospace Institute, MetroHealth RammelKamp Center for Research, and Case Western Reserve University School of Medicine. In addition, nine CSU Chemistry faculty and two CCF Faculty are members in the CSU-established Biomedical and Health Institute (BAHI). BAHI was established at Cleveland State University to enhance and integrate the areas of biomedical science, health sciences, health policy and health managements.

### **Student Demographics**

There were 73 admitted students in the chemistry graduate program during the 2006-2007 academic year. Of these, 54 are in the Ph.D. program and 19 are in the M.S. program. Further, 14 of these students are pursuing certification in Clinical Chemistry and 27 pursuing specialization in Molecular Medicine. Of the 54 Ph.D. students, 15 were performing research at the Lerner Research Institute of the Cleveland Clinic Foundation.

During the Fall Semester 2006 graduate program application cycle, the Chemistry Graduate Committee considered 47 applications for admission, 21 for admission to the Ph.D. Program and 10 for admission to the M.S. program. All these applicants were offered admission to the program. Of the 21 admission offers, 10 accepted the admission offers. Six of the entering students were supported on TA or RA, or CCF Fellowship, while the remaining students were self-supporting.

For the current (Fall 2007) application cycle we received 61 applications, 29 for the Ph.D. program and 24 to the M.S. program. Twenty-three students were offered admission to the Ph.D. program and 19 to the M.S. program. Twelve of the Ph.D. admission offers have been accepted; Ten of these were offered financial support. Data will not be available until Fall Semester as to which students will actually enroll; however, we anticipate that few, if any, of the non-supported students will actually enroll.

Twelve students received the Ph.D. degree during the period May 2006-May 2007. All of these students were employed or entering postdoctoral positions upon graduation. In addition, the M.S. degree was awarded to 12 students.

## **GOALS**

### **Program Goals**

- Goal #1        Students attain a fundamental understanding of all areas of modern chemistry and a sophisticated knowledge and understanding of a specialized area of modern chemistry.
  
- Goal #2        Students attain a deep understanding of the design and execution of experimental and/or theoretical working in the area of specialization
  
- Goal #3        Students attain a professional-level ability to communicate in chemistry and especially in the area of specialization.

### **Development and Evolution**

The Department of Chemistry has benefited from a number of program reviews during the past decade. These include: internal programs reviews in 1991, 1998 and 2004; a program review of the chemistry doctoral program conducted by the Ohio Board of Regents in 1995. Program modifications were made based on recommendations from each of these reviews.

Program goals relating to assessment were developed in direct response to these program reviews and the university assessment mandate. For the Chemistry Graduate Program, the Graduate Program Director, the Director of Clinical Chemistry and the Chemistry Graduate Committee have been responsible for creating, developing, and implementing Assessment Program Goals, while demographic and supporting information has been supplied by departmental support staff.

Changing departmental administration in the above-named key areas of graduate program assessment, has naturally led to continued analysis and refinement of the department's assessment goals.

In academic year 2002-2003, the Graduate Program Director was Dr. Lily Ng. She chaired the Chemistry Graduate Committee at that time and that committee laid the groundwork for assessment of the graduate program in chemistry. They developed and created the assessment

goals and concrete outcome measures (see attached forms).

Dr. Michael Kalafatis was the Graduate Program Director in academic year 2003-2004, and that Chemistry Graduate Committee determined that in order to interpret outcome measures as set by the 2003 team, a structure for data collection needed to be created. As described in the 2004 Chemistry Graduate Program Assessment Report, FINDINGS section, the academic year 2003-2004 was spent in developing a more workable procedure for data collection, establishment of a Graduate Student Profile and Timeline System to track each graduate student from the time he/she enters the program through the terminal degree, and possibly post-graduate career data. Initial data collection resulted in getting students back “on track” in their student careers.

Dr. Yan Xu became the Graduate Program Director beginning January 2005. This graduate program administration for 2005-2007, has been building upon the work of the previous administrations and focused on the following key issues listed below.

*Issue 1. Review the graduate curriculum and implemented major curricular revisions in both the courses and offerings.*

2005 Focus: A significant accomplishment of this year’s Chemistry Graduate Committee was to assess the graduate curriculum. Based on students’ needs and enrollment statistics, the course offerings were restructured and the credit hour requirements were changed from 22 to 28 credit hours. The Graduate Program Director revised the course offering strategy to better reflect the curricular needs of the students, and to also coordinate better with the expectations of the Timeline. Fewer course offerings each semester addressed declining enrollments and course cancellations.

The course CHM 600/700 Chemistry Teaching , for chemistry graduate teaching assistants, had not been offered for a number of years. It has been restructured and now is required for all Teaching Assistants in the Fall and Spring Semesters.

2006 Update: Appendix I shows the revised Graduate Curricula for the M.S. degree in Chemistry and Ph.D. in Chemistry. The curricular offerings for each degree program were revised. In addition, Plans for each degree were created to clearly delineate the structure of each degree program.

2007 Update: We continue to fine tune our course offerings. Several new courses/course sequences have been added. One of these, CHM 690/790, Annual Research Report, will be utilized as a primary assessment tool specifically designed for outcomes in Goal #2. We have also reorganized and expanded the course offering for Biochemistry, adding the new course, CHM 403/503 Biochemistry II. Other courses that have been added are: CHM 507 Environmental Toxicology, CHM 541, Pharmacology I, CHM 542, Pharmacology II, CHM 551 Medicinal Chemistry I, and CHM 552 Medicinal Chemistry II.

*Issue 2. Continue data collection for the Doctoral Student Profile and Timeline.*

2005 Focus: The Student Profile and Timeline have been further developed. A spreadsheet for data collection was created and data collection is on-going. Efforts thus far have provided us easier access to demographics and have also helped us identify each student's position on the Timeline. Thus far, there is better ability to enforce program requirements, which in turn allow more efficient advising and mentoring of the students.

2006 Update: Appendix II is the Overview of the Chemistry Graduate Program which clearly defines the Student Timeline to graduation. It also contains the Annual Progress Report which will be implemented for the Fall 2006 Academic Year.

This year we continued our efforts to move each student along to his/her proper place in the career Timeline. This was a very successful endeavor as all of our students are now "on track" for the various phases of the program. This success is also evident by the more than 50% increase in program graduates over the previous cycle.

2007 Update: We continue to fine-tune program management to place and move students along the Career Timeline. This year we instituted a policy of a five year limit for financial support to Teaching Assistants. A one year extension is possible, should the situation warrant. In addition, we have implemented stricter controls by imposing registration holds for students who should be taking the Ph.D. Candidacy Exam (CHM 891). Eighteen of twenty-one students have taken the Candidacy Exam this past academic year. The remaining three will take the exam over the upcoming summer semester.

*Issue 3. Streamline program management*

2005 Focus: It was determined that a computer database-type system was crucial to long-term assessment. It was decided that time needed to be invested now to develop a system whereby many types of student/faculty/program data could be collected and efficiently analyzed. It was considered that database software could be written specifically for our department's graduate (and undergraduate) assessment programs. Such software would have the added benefit of assisting in preparation of many types of reports and program reviews. To this end we are pursuing the feasibility of using the university's "e-portfolio" system to collect data and we are currently in meetings with the e-portfolio personnel to possibly develop a system for chemistry. Our goal is to have a system in place in the upcoming academic year. Should this system not meet our needs our next step would

be to consider specialized software that could be written by one of our faculty members.

2006 Update: We had several meetings with the IS&T software developers to modify the “e-portfolio” system for our program. Unfortunately, they did not have the staffing to develop a program to meet our needs. We have met with an outside database software developer who is currently writing a program for us data management, but will also provide a portfolio component for our students to use as a career tool.

2007 Update: The software developer we met with last year was unable to provide a program at this time. Therefore, the departmental administrative coordinator researched and downloaded trial database software that are currently on the market. One of them (FileMakerPro) has been determined to have the most features that we would like, except perhaps the e-portfolio feature. It is possible after working with the software we may be able to create a separate database for the students to enter or submit data for entry by one of our staff.

We have purchased a multiple copy site license of this software and a database will be created by the department’s administrative coordinator. Data will be input over the course of the upcoming academic year. One desirable feature of this software is that it has the capability to be uploaded to a server (which is included as part of the site license). Should this capability be acceptable with CSU’s IS&T department, chemistry department administration would be able to view each student’s career data in real time.

Stipends have been increased for teaching assistants. Entering students receive a stipend of \$16,500, which increases to \$18,000 once the candidacy exam has been passed.

Innovative “3+2” and “4+1” programs are in various stages of development. These programs are attractive recruitment tools, as students can complete two degrees in a shorter period of time. Because our department bears no financial burden, has a boost in enrollment and graduates more students, these are attractive programs to implement. The “3+2” program we are currently pursuing involves universities in mainland China and is pending approval. The second program, “4+1” is under discussion with local colleges. Students entering the program must meet the university admission requirements, but the department could conditionally admit students with  $\geq 2.8$ , and waive GRE and other requirements.

For the past two years we have submitted proposals to the “Graduate Assistance in Areas of National Need (GAANN)” Program of the US

Department of Education. This year, our proposal has been selected for funding (AY 2007-2010). According to the US Department of Education, this year's Panel Review was extremely competitive and our selection is a significant achievement. The GAANN grant award will allow us to admit and support four GAANN Fellows in our PhD program.

In summary, the Department of Chemistry continues to build on its original stated goals by systematically targeting areas of improvement and focusing on the improvements.

## **OUTCOMES**

**Goal #1** Students attain a fundamental understanding of all areas of chemistry and a sophisticated knowledge and understanding of a specialized area of modern chemistry

An important outcome for any program is the successful completion of coursework. In a Ph.D.-granting program, another component is the successful defense of the Ph.D. proposal. With one or two exceptions, graduate students successfully defend the Ph.D. proposal on the first attempt, and then become eligible to continue the process toward the granting of the Ph.D. degree.

Therefore this is a very high success outcome for Goal #1. The reason for this high success rate is the high standard for admission to the graduate program, excellent preparation in coursework and the research project.

Another indicator for success is the post-graduate success of program graduates. Our Ph.D. graduate students in particular continue to attain 100% employment. The majority of our M.S. students are typically currently employed in the Greater Cleveland area while in the program and the M.S. degree leads to professional advancement. Twelve Ph.D. students graduated during the assessment period and each of them was employed immediately upon graduation.

*These points show that we have been extremely successful in achieving Goal #1.*

**Goal #2** Students attain a deep understanding and execution of experimental and/or theoretical working in the area of specialization

After the student has progressed in the program beyond the defense of the Ph.D. proposal, the subsequent level is the successful defense of the Ph.D. dissertation. The Department of Chemistry has had no student not bring their Ph.D. research to a successful conclusion and therefore, *we find that we have exceptional outcomes for Goal #2.*

Each academic year, the graduate students are required to present the results of their most recent research. In the past, the forum for this presentation was the CSU-CCF Student Symposium of the Joint Ph.D. Program in Clinical-Bioanalytical Chemistry. However, the College of Science has initiated a college-wide research day, which has become the forum for the presentation of research results. This program is now held each October and is attended by faculty and researchers from Cleveland State University, the Cleveland Clinic Foundation and MetroHealth Medical Center. Twelve chemistry graduate students participated in the College of Science Research Day which was held October 20, 2006.

With the new course CHM 690/790, Annual Research Report, the Chemistry Department will have an additional means to annual measure the improvement of our graduate students.

*These activities directly relate to Goal #2 and demonstrate consistent improvement.*

**Goal #3** Students attain a professional-level ability to communicate in chemistry and especially in the area of specialization.

Students are also encouraged to participate in local, regional and national professional meetings by presenting papers or poster sessions. For students participation outside the Cleveland area is very difficult without financial support. Chemistry students garnered 23 College of Science Student Travel Awards during over the past academic year, with the Department of Chemistry providing matching funding during the Spring Semester round of awards. An increased level of faculty grant funding, College and Department support enabled 21 Ph.D. students to attend and present their work in the form of posters and presentations at various other professional conferences outside of the Cleveland area, with several winning awards. This is a 33% increase in conference participation over the previous assessment period. Appendix A shows the awardees and the conferences they attended.

## **CONCLUSION**

The Department of Chemistry continues to improve its assessment efforts by consistently fine-tuning the assessment process. We have made steady progress from the original establishment of goals, to streamlining program management and revising curriculum. We find that we have exceptional student outcomes in areas of degree completion and employment rates and our students continue to exhibit steady improvement in areas such as publication and presentations.

<b>Appendix A</b>		
<b>Graduate Student Activities 2006-2007</b>		
<b>Department of Chemistry</b>		
<b>Award/Grant</b>	<b>Conference</b>	<b>Abstract</b>
	Invited Presentation, Plant Molecular Biology Symposium, Columbus, OH 3/30/07	oral presentation
COS Travel Award Spring 2006	Cinquieme Conference Internationalae sur la Science des Matgerieux , Beirut, Lebanon, May 2006	poster presentation
	American Chemical Society, Southwest Regional Meeting, Houston, TX, October 2006	oral presentation
COS Travel Award Spring 2007		
	American Chemical Society Meeting in Miniature, Cleveland, OH March 2007	oral presentation
COS Travel Award Spring 2006	American Chemical Society, 61st Northwest Regional Meeting, Reno, NV, June, 2006	poster presentation
CSU DDREAP Award 2006-2007	American Chemical Society, Southwest Regional Meeting, Houston, TX, October 2006	oral presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	American Association for Cancer Research Meeting, Washington DC	poster presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
CSU DDREAP Award 2006-2007		
CSU BAHI Travel Award 2006	American Society of Hematology 8th Annual Meeting, Orlando, FL, Dec 2006	poster presentation
	American Chemical Society Meeting in Miniature, Cleveland, OH March 2007	oral presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	23rd National Meeting of the American Chemical Society, Atlanta, GA, March 2006	oral presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	American Association for Cancer Research Meeting, Washington DC Apr 2006	poster presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
CSU DDREAP Award 2006-2007		
AHA pre-doctoral Fellowship 2005-07		
NIH Fellowship 2006-2010	"Factor VA Regulation of Prothrombinase Activity"	
CSU DDREAP Award 2006-2007		
	7th Annual Symposium of Experimental Therapeutics in Oncology, Geneva, OH, July 2006	
	American Chemical Society Meeting in Miniature, Cleveland, OH March 2007	oral presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation

	7th Annual Symposium of Experimental Therapeutics in Oncology, Geneva, OH, July 2006	
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	2006 American Association of Clinical Chemistry, 2006 Annual Meeting, Chicago, IL, July 2006	poster presentation
COS Travel Award Spring 2006	209th Meeting of the Electrochemical Society, Denver, CO May 2006	oral & poster presentations
COS Travel Award Spring 2006	American Chemical Society 231st National Meeting & Exposition, Atlanta, GA March, 2006	
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	2006 American Association for Cancer Research Annual Meeting, Washington, DC April 2006	oral presentation
CSU BAHJ Travel Award 2006	American Society of Hematology 8th Annual Meeting, Orlando, FL, Dec 2006	poster presentation
	American Chemical Society Meeting in Miniature, Cleveland, OH March 2007	oral presentation
COS Travel Award Spring 2007		
COS Travel Award Spring 2006	American Chemical Society 61st Northwest Regional Meeting, Reno, NV June 2006	oral & poster presentations
COS Travel Award Spring 2007	211th Meeting of the Electrochemical Society, Chicago, IL May 2007	oral presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	American Chemical Society 61st Northwest Regional Meeting, Reno, NV June 2006	oral/poster presentation
COS Travel Award Spring 2007	211th Meeting of the Electrochemical Society, Chicago, IL May 2007	oral presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
	7th Annual Symposium of Experimental Therapeutics in Oncology, Geneva, OH July 2006	
COS Travel Award Spring 2006	232nd National Meeting of the American Chemical Society, San Francisco, CA, Sep 2006	poster presentation
	CSU College of Science (COS) Research Day, October, 2006	poster presentation
COS Travel Award Spring 2006	54th National Meeting of the American Society of Mass Spectrometry, Seattle, WA, May 2006	oral presentation
COS Travel Award Spring 2007		
	American Chemical Society Meeting in Miniature, Cleveland, OH March 2007	oral presentation
COS Travel Award Spring 2006	ASBMB/JBC Experimental Biology Meeting, San Francisco, CA Apr 2006	poster presentation