Florida Atlantic University
Academic Program Review
Self-Study Report Chemistry and Biochemistry

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A. Mission and Purpose of the Program

Consistent with the mission of the university and college, the Department of Chemistry and Biochemistry has recently developed the following mission statement: “The mission of the Department of Chemistry & Biochemistry is to provide high quality education and state-of–the–art training in research in the fields of Chemistry & Biochemistry through excellence in teaching, research and service. In teaching we will provide to our students the foundation to build a chemistry knowledge base and introduce them to the recent advances in the field. In research we will provide high quality experience in both fundamental and applied research. We will continue to perform basic research that may lead to the discovery of new drugs for the treatment of major diseases and developing new materials for enhancing the quality of life. We will provide service to the university through joint interdisciplinary programs in biomedical, life and environmental sciences and will provide a strong infrastructure consisting of modern and powerful investigative instrumentation. We will provide service to the region and nation by contributing scientific expertise. We will help train high tech workforce needed to help meet the growing demands of industry in Southeast Florida in order to support and sustain economic development in the region.”

B. Previous External Reviews

The Committee on Professional Training of the American Chemical Society (ACS) reviews undergraduate chemistry programs every five years. Our last full review was reported in December 2012, when it found our program to be consistent with their guidelines for program certification. In accord with the University’s Quality Enhancement Plan (QEP), we incorporated several research oriented assignments and topics into chemistry courses for our majors, including Inorganic Chemistry (CHM 3609), Organic Chemistry Laboratory (CHM 2211L) and both Physical Chemistry Laboratory courses (CHM 3410L and 3411L). In addition, we added a requirement for a third semester of mathematics in our BS degree program to ensure improved student success in the Physical Chemistry and other mathematically intensive courses.

C. Instruction

Establishment of Student Learning Outcomes (SLOs)

Students enrolled in a BA or BS in chemistry degree are expected to have a thorough understanding of the basic concepts, theories, and experimental findings in the core areas of chemistry: analytical, biochemical, inorganic and physical chemistry. In addition, students will be expected to produce writing that is grammatically correct, well-organized, and properly formatted in accord with the American Chemical Society's (ACS) Style Guide. Furthermore, students are expected to become adept at using critical thinking to evaluate information and data related to chemical processes by applying basic principles of scientific methodology. These include:

(1) the nature of scientific explanations,
(2) threats to the validity and reliability of observations,
(3) the limitations of measurement scales,
(4) the use of experimental and quasi-experimental designs to test hypotheses and
(5) the proper interpretation of correlational and experimental data.

Students in the BA program are also expected to perform laboratory techniques sufficient to conduct basic and advanced experiments in chemistry and biochemistry. These student learning outcomes (SLOs) for both our BA and BS programs are also fully described in the Academic Learning Compacts (ALCs) which can be found in Appendix A.

Assessment of SLOs and Program Improvement

In the last four years we have begun instituting normalized ACS exams in key core courses (in both BS and BA programs) to evaluate our students' performance and achievement in comparison to national averages. Results indicate that our students are performing in the 20th-80th percentile nationally, depending on the course, as shown in the Table in Appendix B.

The core courses in the Department of Chemistry and Biochemistry are ACS certified and all courses are also periodically evaluated for content and level of instruction through examination of course syllabi by a departmental committee. This committee has indicated no major problems in the last six years. Also, all faculty are assessed for quality of teaching by a designated master teacher on a regular basis. In the last six years, the quality of teaching by faculty in our Department has been reported to be satisfactory to excellent, depending on the instructor.

Results of all assessments are discussed among the members of the appropriate program committee (i.e., undergraduate or graduate), who then make recommendations on any needed changes. For example: as part of our plans for continues quality improvement of our program, we have recently restructured the discussion sections for the Organic Chemistry lecture (CHM 2210) course to combine peer-led-team-learning (PLTL) with computer aided instruction. As a result of these changes we have seen a significant improvement in student understanding of organic chemistry concepts and performance in the course. This program improvement has benefitted our majors and students form other departments and colleges across the university who take this course.

Baccalaureate Programs

i. State-Approved Prerequisites:

The Department of Chemistry and Biochemistry has three Intellectual Foundations Program (IFP), i.e., core curriculum courses. These are: General Chemistry lecture course (CHM 2045), Contemporary Chemical Issues (CHM 1020C) and General Chemistry for the Health Sciences (CHM 2032). The University's Core Curriculum Committee has thoroughly reviewed these courses for compliance with FL SUS requirements per regulation 6.017. The University Undergraduate Programs Committee (UUPC) has recommended these courses for approval to the faculty senate and we fully expect that all courses will be approved at the next senate meeting.

ii. Limited Access:

The BA and BS programs in Chemistry are not limited access programs; they are open to all students admitted to FAU.

iii. Admissions Criteria:

Incoming Chemistry majors must meet admissions criteria established by the University as described in the University catalog: http://www.fau.edu/academic/registrar/FAUcatalog/admissions.php

iv. Undergraduate Enrollment Information:

The data in Table 1 (below) indicates that the number of undergraduate Chemistry majors has remained constant over the last two years at 342. This corresponds to ~6 % of all majors in the college and ~1.2 % of students at FAU. In contrast the data in Tables 2 (below) shows that the FTEs of students (majors and non-majors) taking undergraduate chemistry courses has steadily increased since 2010-2011 academic year. For instance, in the 2012-2013 academic year, the annualized state-fundable FTEs in chemistry courses accounted for ~13 % of the collage total and ~3.3 % of the university total. These differences in trends from Tables 1 and 2 indicate that the Department teaches a substantial number of courses to non-chemistry majors from our college and across FAU. The data in Table 3 further shows that these trends are mainly due to substantial enrollment of non-majors in lower division chemistry courses.

Table 1: Headcount for all undergraduates Chemistry majors.

Annual Headcount (program CIP: 400501)	Chemistry		College Total	University Total
	2011-2012	2012-2013	2012-2013	2012-2013
Bachelors	342	342	5,617	28,523

Table 2: FTE data for all students taking undergraduate chemistry courses.

Annualized State-Fundable FTE	Chemistry			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate Total	477.8	491.9	513.6	3,948.6	15,335.0

Table 3: Break-down by course level of FTE data for all students taking undergraduate chemistry courses.

Annualized Undergraduate State-Fundable FTE Produced In/Out of Department/College		Chemistry			College of Science	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Course Level	FTE produced by students who are:					
Lower Division	Majors within the department	21.3	23.9	24.3	202.4	729.1
	Majors outside the department, but within the college	225.7	260.7	278.5	839.9	1,743.9
	Majors outside the college	131.9	116.9	124.5	1,606.2	4,111.2
	Total	**378.9**	**401.4**	**427.3**	**2,648.5**	**6,584.2**
Upper Division	FTE produced by students who are:					
	Majors within the department	38.6	34.3	32.4	785.7	5,103.4
	Majors outside the department, but within the college	53.2	47.7	45.3	268.5	2,343.8
	Majors outside the college	7.1	8.5	8.5	246.0	1,303.6
	Total	**98.9**	**90.5**	**86.3**	**1,300.2**	**8,750.8**

v. Average Class Size and Faculty/Student Ratio:

For the 2012-2013 academic year there were 16 faculty in the Department and 342 majors, for an overall Departmental "students in the major" to faculty ratio of ~21.4 to 1. The data in Table 4 (below) summarizes average class sizes in undergraduate chemistry classes with a comparison to the college and university data.

Table 4: Average course section size and percent of sections taught by faculty for the Department of Chemistry and Biochemistry.

Undergraduate Classes		Chemistry			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Type						
Lecture/ Seminar	# Sections	42	45	46	692	5,154
	# Enrolled	5,319	5,490	5,797	47,552	192,004
	Avg Section Enrollment	**126.6**	**122.0**	**126.0**	**68.7**	**37.3**
	# Faculty Taught	41	45	46	475	3,487
	% Faculty Taught	**97.6**	**100**	**100**	**68.6**	**67.7**
Lab	# Sections	136	151	147	633	931
	# Enrolled	2,996	3,131	3,288	12,456	18,859
	Avg Section Enrollment	**22.0**	**20.7**	**22.4**	**19.7**	**20.3**
	# Faculty Taught	136	145	147	345	502
	% Faculty Taught	**100**	**96.0**	**100**	**54.5**	**53.9**
Discussion	# Sections	8	9	9	125	258
	# Enrolled	700	860	981	3,989	7,208
	Avg Section Enrollment	**87.5**	**95.6**	**109.0**	**31.9**	**27.9**
	# Faculty Taught	8	6	0	78	211
	% Faculty Taught	**100**	**66.7**	**0.0**	**62.4**	**81.8**
Other Course Types	# Sections	52	67	35	322	1,380
	# Enrolled	72	78	50	974	8,897
	Avg Section Enrollment	**1.4**	**1.2**	**1.4**	**3.0**	**6.4**
	# Faculty Taught	52	67	35	304	1,073
	% Faculty Taught	**100.0**	**100.0**	**100.0**	**94.4**	**77.8**

Further class size and faculty/student ratio analysis:

Lower division lecture courses: The majority of the large to medium lecture sections in chemistry are in lower division courses taught by tenured, tenure-track and non-tenured faculty (including instructors and scientists) with the aid of undergraduate and graduate teaching assistants. Our Department rarely employs adjuncts or graduate students to teach such courses, with an exception in Fall 2013 where a senior graduate student taught one section (~200 students) of Organic I Chemistry (CHM 2210) to augment his overall professional preparation. Student to faculty ratios for lower division lecture course sections vary between 50 to 1 and up to 350 to 1.

Lower division lab sections: All lower division lab sections are capped at 24 students and are facilitated by chemistry graduate teaching assistants (GTAs) or equivalently qualified graduate students from other departments. Departmental policies limit the in-lab ratio of students to GTAs to 24 to 1 for general chemistry, and ~ 24 to 1.5 for organic chemistry. All sections and GTAs within a course are closely supervised by at least one faculty member.

Upper division lecture courses: These courses are taught mainly by tenure-track or tenured faculty and occasionally by scientists and instructors. They are generally small to medium sized classes with student to faculty ratios as low as 8 to 1 and as high as 50 to 1.

Upper division lab sections: All upper division lab sections are capped at 24 students and directly supervised by faculty with the aid of senior GTAs. Faculty teaching these courses are generally tenured or tenure-track and occasionally non-tenure track. The student to faculty ratio is 24 to 1. The ratio increases to 24 to 3, if GTAs are included as part of the faculty count.

***vi. Curriculum*:**

The curriculum for our undergraduate degrees, as described in the FAU catalog, are shown below:

The Bachelor of Arts (B.A.) is a liberal arts degree intended for students planning professional careers in chemistry-related professions. These include health professions (medicine, dentistry, pharmacy), environmental consulting, technical sales and secondary school teaching. This degree is often pursued by students studying in related disciplines (e.g., biological sciences, geology, neuroscience and behavior) who wish to obtain a second major or a second degree.

The Bachelor of Science degrees (B.S.) are designed for students preparing for professional careers as chemists in industry, government or academic research. Students interested in pursuing advanced graduate studies in chemistry, biochemistry or related fields should also follow one of the B.S. degree programs.

Two B.S. degree programs in Chemistry are offered:

1. The ***ACS-Approved B.S. Program*** offers a rigorous program of study in all aspects of inorganic, organic, analytical, biochemical and physical chemistry. Its curriculum corresponds to certification guidelines of the Committee on Professional Training of the American Chemical Society (ACS). An ACS-certified degree can offer advantages in job placement and graduate school admission.

2. The ***B.S. Program with a Concentration in Biochemistry*** is designed for students pursuing careers in biochemistry and related disciplines, such as molecular biology, biophysics and pharmacology. Additionally, premedical students who wish to pursue a research-oriented curriculum might be interested in this program.

Core Curriculum:

All Chemistry majors must take a minimum of 16 credits of chemistry at Florida Atlantic University. The following courses are required for all Chemistry majors:

Biochemistry 1	BCH 3033	3
General Chemistry 1	CHM 2045	3
General Chemistry 1 Lab	CHM 2045L	1
General Chemistry 2	CHM 2046	3
General Chemistry 2 Lab	CHM 2046L	1
Organic Chemistry 1	CHM 2210	3
Organic Chemistry 2	CHM 2211	3
Organic Chemistry Lab	CHM 2211L	2
Quantitative Analysis	CHM 3120	2
Quantitative Analysis Lab	CHM 3120L	2
General Physics 1 Lab	PHY 2048L	1
General Physics 2 Lab	PHY 2049L	1

In addition to the core curriculum, the B.A. degree program requires the following courses:

Biochemistry Lab	BCH 3103L	3
Introduction to Physical Chemistry	CHM 3400	3
Inorganic Chemistry	CHM 3609	3
Inorganic Chemistry Lab	CHM 3609L	1
College Algebra	MAC 1105	3
Methods of Calculus	MAC 2233	3
College Physics 1	PHY 2053	4
College Physics 2	PHY 2054	4

Bachelor of Science with Major in Chemistry: ACS-Approved Program

In addition to the core curriculum, the ACS-Approved B.S. degree program requires the following courses:

Chemical Literature	CHM 3060	1
Physical Chemistry 1	CHM 3410	3
Physical Chemistry 1 Lab	CHM 3410L	2
Physical Chemistry 2	CHM 3411	3
Physical Chemistry 2 Lab	CHM 3411L	2
Inorganic Chemistry	CHM 3609	3
Inorganic Chemistry Lab	CHM 3609L	1
Bioanalytical Instrumentation	CHM 4139	2
Bioanalytical Instrumentation Lab	CHM 4139L	2
Calculus with Analytic Geometry 1	MAC 2311	4
Calculus with Analytic Geometry 2	MAC 2312	4
General Physics 1	PHY 2048	4
General Physics 2	PHY 2049	4

One of the following:		
Calculus with Analytic Geometry 3	MAC 2313	3
Differential Equations 1	MAP 2302	3

Three of the following:		
Biochemistry 2	BCH 3034	3
Environmental Chemistry	CHM 3080	3
Organic Chemistry 3	CHM 4220	3
Materials Chemistry	CHM 4714	3
Directed Independent Study	CHM 4905	3

Bachelor of Science with Major in Chemistry: Concentration in Biochemistry

In addition to the core curriculum, the B.S. in Chemistry (Biochemistry concentration) program requires the following courses:

Biochemistry 2	BCH 3034	3
Biochemistry Lab	BCH 3103L	3
Advanced Biochemistry	BCH 4035	3
Biological Principles	BSC 1010	3
Biological Principles Lab	BSC 1010L	1
Chemical Literature	CHM 3060	1
Physical Chemistry 1	CHM 3410	3
Physical Chemistry 1 Lab	CHM 3410L	2
Physical Chemistry 2	CHM 3411	3
Physical Chemistry 2 Lab	CHM 3411L	2
Bioanalytical Instrumentation	CHM 4139	2
Bioanalytical Instrumentation Lab	CHM 4139L	2
Calculus with Analytic Geometry 1	MAC 2311	4
Calculus with Analytic Geometry 2	MAC 2312	4
General Physics 1	PHY 2048	4 **or**
College Physics 1	PHY 2053	4
General Physics 2	PHY 2049	4 **or**
College Physics 2	PHY 2054	4

One of the following:		
Calculus with Analytic Geometry 3	MAC 2313	3
Differential Equations 1	MAP 2302	3

Two of the following:		
Inorganic Chemistry	CHM 3609	3
Directed Independent Study	CHM 4905	3
General Microbiology	MCB 3020	3
Molecular and Cell Biology	PCB 4023	3

Our BA and BS degrees are designed to be completed in four years. These requirements are virtually identical to those required by other FL SUS institutions, e.g., Florida State University (FSU), the University of Central Florida (UCF) and University of Florida (UF) (see: https://catalog.ufl.edu/ugrad/current/liberalarts/alc/chemistry.aspx).

In addition, our BS program conforms to all requirements for certification by the Committee on Professional Training of the American Chemical Society (ACS) as attached in Appendix C. This ensures that our program is very similarly to other chemistry programs in Florida and across the country.

vii. Internships, Practicum, Study Abroad, Field Experiences:

Our internship programs are small and informal. Over the past five years three students have completed internships at government agencies such as: the Broward County Forensic Lab, Sherriff's Office and the Broward County Coroner. In addition, some internships have been established with local industries, such as: Surface Chemists of Florida (Jupiter FL), and Exotech Inc. (Pompano Beach FL).

On average one to three chemistry students engage in study abroad programs each year, at universities in a variety of countries around the world, including Spain, France and Italy.

viii. Pedagogy/Pedagogical Innovations:

a. General Chemistry - NSF initiated Project ChemBOND continues and grows.

Project ChemBOND was initiated by a National Science Foundation (NSF) grant, obtained 15 years ago. This project involves the implementation of peer-led-team-learning (PLTL) sessions using non-traditional group activities to improve student learning. We have found this program initially lowered the DFW rate in General Chemistry I course by ~ 20 %. We continue to improve the training of peer-leaders, and the pedagogy and content of these activities. In addition, each peer-leader is now required to hold at least one office hour per week, which has significantly improved student access for tutoring assistance.

b. Organic Chemistry Lecture - OrgoBOND technology-based redesign

We have integrated a web-based homework system into our existing Peer-Led Team Learning (PLTL) program, in our Organic Chemistry I course, to enhance student learning, improve overall grades and lower the DFW rates for that course. In our PLTL program, called OrgoBONDing, students work collaboratively in small groups to develop problem-solving skills, and are guided by a "peer leaders" in this process. We have maintained these important elements of the PLTL OrgoBONDing program.

In the restructured OrgoBONDing sessions, students meet once a week to initially work on computer-based assignments individually, and then discuss the problems as a small group with peer-leader guidance before submitting their answers. We ensure that the individual computer assignments are unique to each student and are created from a pool of questions covering the same concepts, which directly reflect the topic recently reviewed in lecture. A benefit of this arrangement is that students collectively solve different types of questions on a particular subject. Additionally, students are given compulsory online homework.

Preliminary results have been very encouraging with students performing better on the standardized ACS final exams then in previous semesters.

c. Organic Chemistry Lab - ongoing innovative improvements including basic research experiences

We incorporated research-based learning in the Organic Chemistry Lab course. This involves asking students to conduct independent experiments under varied conditions directed toward the synthesis and characterization of a specific target product. The students then pool their results to determine the optimal conditions for such a synthesis and characterization.

d. Innovative advanced instrumentation acquisition through internal and extramural funding and implementation across the chemistry curriculum

We have acquired many new educational and research-grade instruments thorough the *FAU Tech fee* funding mechanism. These include: a thermo analyzer, near Infra-Red and UV-Visible spectrometers, and an X-ray diffractometer. These instruments were incorporated in several of our chemistry courses, including: Organic Chemistry Lab, Inorganic Chemistry Lab, and Bioanalytical Instrumentation, thus providing students with an increase use of cutting-edge computer-interfaced instrumentation. Additionally, we obtained a grant from the National Science Foundation to obtain and operate a modern Raman spectrometer with microscope. We are in the process of incorporating experiments using the Raman spectrometer in courses throughout our curriculum. We believe we are the first to do this.

e. Incorporation of various other active learning and innovative approaches by faculty in chemistry courses across the curriculum

In addition to those innovations discussed above we incorporated new pedagogical approaches in some of our courses, these include:

1) research-based presentations in the Inorganic Chemistry Lecture course,
2) flipped-class approaches to class-sessions and other activities in the Analytical and Organic Chemistry II lecture courses
3) a complete redesign of both Physical Chemistry I and II Lab courses to include the most up-to date experiments and computer simulations.

ix. Scope of Institutional Contributions:

Our institutional contributions include courses offered under the Intellectual Foundations Program or IFP (i.e. core curriculum requirements) as well as other service courses offered to students for their majors in the college of science. The IFP courses consist of:

1) General Chemistry 1 (CHM 2032) lecture and lab, which have average and growing enrollments of ~ 2000 students per year, This course is taken by both science and non-science majors.
2) Contemporary Chemical Issues (CHM 1020C), which has average enrollment of ~400 students per year. This course is primarily taken by non-science majors.

Other service courses are primarily taken by biology, neuroscience majors and pre-professional students. The other service courses consist of:

1) General Chemistry 2 (CHM 2046) lecture and lab, which have average enrollment of ~1000 students per year,
2) Organic Chemistry 1 (CHM 2210), which has average and growing enrollment of ~900 students per year,
3) Organic Chemistry 2 (CHM 2211) lecture and lab courses, which have average enrollments of ~900 students per year for the lecture and ~ 450 students per year for the lab, and
4) Biochemistry 1 (BCH 3033) lecture, which has an enrollment of ~600 students per year.

These data indicate that the vast majority of students that are taught in chemistry courses are taken by non-chemistry majors. Courses with the largest enrollments are at the lower division. Additionally, the Department offers courses in support of several certificate programs including those in Biotechnology and Environmental Sciences.

x. Student Profile:

Numerical and demographic data for undergraduate chemistry majors is listed in Table 5. As shown there, about 340 students report as chemistry majors, with the number being unchanged for the last two years. Demographics are also stable, with 11% of our majors being Asian American, 20% Hispanic, 11% Black, and 46% White. These demographics are similar to those for the entire university, with the exception of Asian Americans, who constitute a greater percentage of our majors than in the entire student body (11% vs. 5%, respectively). Although there have been some minor fluctuations, the percentage of undergraduate chemistry majors consists of 50 +/- 2% males and 50 +/- 2% females. This is a greater percentage of male students than that of FAU as a whole (FAU ratio is: ~60% female: ~40% male).

Table 5: Student diversity and demographics of undergraduate chemistry majors, compared with college and university totals.

Undergraduate (Program CIP: 400501)		Chemistry		College Total	University Total
		2011-2012	2012-2013	2012-2013	2012-2013
American Indian/ Alaskan Native	Female		1	23	96
	Male	1	1	13	77
	Total	**1**	**2**	**36**	**173**
Asian or Pacific Islander	Female	18	19	247	776
	Male	15	18	145	664
	Total	**33**	**37**	**392**	**1,440**
Black (Not of Hispanic Origin)	Female	34	37	769	3,535
	Male	38	28	334	2,129
	Total	**72**	**65**	**1,103**	**5,664**
Hispanic	Female	34	42	952	3,922
	Male	23	28	435	2,855
	Total	**57**	**70**	**1,387**	**6,777**
White (Not of	Female	72	72	1,576	7,431

Undergraduate (Program CIP: 400501)		Chemistry		College Total	University Total
		2011-2012	2012-2013	2012-2013	2012-2013
Hispanic Origin)	Male	91	85	956	6,217
	Total	**163**	**157**	**2,532**	**13,648**
Non-Resident Alien	Female	8	5	87	318
	Male	6	4	30	294
	Total	**14**	**9**	**117**	**612**
Not Reported	Female			33	130
	Male	2	2	17	79
	Total	**2**	**2**	**50**	**209**
Total	Female	166	176	3,687	16,208
	Male	176	166	1,930	12,315
	Total	**342**	**342**	**5,617**	**28,523**

xi. Advising Procedures:

Advising of undergraduate science majors is centralized in the Charles E. Schmidt College of Science (CESCoS) Student Services Office. An advisor is assigned to chemistry majors and works closely with faculty in the Department to ensure that students are informed properly.

Advising begins at orientation in the CESCoS Student Services Office and includes:

- Evaluation if IFP/General Education and Language Requirements.
- Initial advising for foundational coursework in the major: Calculus I and II, General Chemistry I and II, Organic Chemistry I and II and Quantitative Analysis.
- Preparation of evaluation of chemistry courses by faculty advisors if necessary.
- Guidance in minors and certificates appropriate to vocational career objectives.

Ongoing advising occurs in the CESCoS Student Services Office for at least two semesters; this includes:

- Follow up on IFP/General Education and Language Requirements.
- Recommendations for required core courses.
- Referral to faculty advisors (generally after foundational coursework is near completion)
- Continued guidance in minors and certificates appropriate to vocational career objectives.

After three semesters, students are directed to seek faculty advising for undergraduate research opportunities, career counseling, and electives. The faculty advisors in the Department are: Dr. Daniel Huchital, Dr. Donna Chamely-Wiik and Dr. Evonne Rezler. The CESCoS Student Services Office continues to serve as a resource for clerical and administrative advising functions, guidance in minors and certificates appropriate to vocational career objectives, and any related advising issues of a general nature.

xii. Licensure Rates (if applicable):

There is no licensing program for Chemistry majors.

xiii. Placement Rates/Employment Profile:

The Department of Chemistry and Biochemistry does not collect or receive placement data for undergraduate Chemistry majors. However, we aware that many of our B.S. graduates have obtained excellent positions both in South Florida and elsewhere, including Pharmaceutical companies, government regulatory agencies and the aerospace industry. In addition, many of our students go on to graduate programs both at FAU and other prestigious universities.

xiv. Retention Rates and xv. Graduation Rates:

In Tables 6-11 below the retention and graduation rates for undergraduate Chemistry majors (for both BA and BS degrees) are given for FTIC students and transferring from a Florida public community college (with or without an AA degree).

The University and the Board of Governors (BoG) have established three performance matrices to specifically evaluate retention and graduation data for institutions in the FL State University System (SUS). These are:

Metric 4: 6-year graduation rate for full- and part-time First-Time-In-College (FTIC) students; and

Metric 5: Academic progress rate, which is measured by the 2nd year retention of students with a Grade Point Average (GPA) above 2.0; and

Metric 6: Bachelor's degrees awarded in areas of strategic emphasis (includes STEM).

In reference to the BoG targeted metrics the following conclusions can be reached regarding Chemistry majors:

1) Six year graduation rates varied from a low of 31% to a high of 50 % for students entering in the years 2000-2007. This has generally been equal or higher than the overall college rate.

2) Second year persistence rates ranged from a low of 68.4 % for students entering in the year 2000, to a high of 92.5 % for students entering in 2008. The persistence rates from ten of the last twelve years exceeded 80 %.

3) The number of students graduated each year range from 18.5 in 2002-2003 to a high of 49.5 in 2013-2014. While there is some variability in the number of graduates each year, the general trend exhibited an overall increase over the last twelve years.

Table 6: The retention (and graduation) rates for FTIC undergraduate Chemistry majors through second year, since the year 2000.

Outcomes through year 2			Entering Year												
			2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		#	19	20	28	24	29	20	32	50	40	38	47	63	60
		%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Graduate @ FAU		#	-	-	-	-	-	-	-	-	-	-	1	-	-
		%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.1**	**-**	**-**
Graduate @ other SUS Institution		#	-	-	-	-	-	-	-	-	-	-	-	-	-
		%	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist		#	13	17	23	19	27	17	27	41	37	33	41	51	-
		%	**68.4**	**85**	**82.1**	**79.2**	**93.1**	**85**	**84.4**	**82**	**92.5**	**86.8**	**87.2**	**81**	**-**
Transfer to other SUS		#	1	-	-	-	-	-	-	2	-	1	1	2	-
		%	**5.3**	**-**	**-**	**-**	**-**	**-**	**-**	**4**	**-**	**2.6**	**2.1**	**3.2**	**-**
Leave		#	5	3	5	5	2	3	5	7	3	4	4	10	-
		%	**26.3**	**15**	**17.9**	**20.8**	**6.9**	**15**	**15.6**	**14**	**7.5**	**10.5**	**8.5**	**15.9**	**-**

Table 7: The retention (and graduation) rates for undergraduate Chemistry majors transferring from a Florida public community college (with or without an AA degree), through second year, since the year 2000.

Outcomes through year 2			Entering Year												
			2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		#	19	19	15	15	17	21	42	25	43	40	38	40	58
		%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Graduate @ FAU		#	1	-	4	3	3	5	6	1	3	3	5	1	-
		%	**5.3**	**-**	**26.7**	**20**	**17.6**	**23.8**	**14.3**	**4**	**7**	**7.5**	**13.2**	**2.5**	**-**
Graduate @ other SUS Institution		#	-	-	-	1	-	-	-	-	-	-	-	-	-
		%	**-**	**-**	**-**	**6.7**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Persist		#	12	17	9	6	9	12	30	15	31	29	21	26	-
		%	**63.2**	**89.5**	**60**	**40**	**52.9**	**57.1**	**71.4**	**60**	**72.1**	**72.5**	**55.3**	**65**	**-**
Transfer to other SUS		#	-	-	-	-	2	1	-	2	1	-	-	4	-
		%	**-**	**-**	**-**	**-**	**11.8**	**4.8**	**-**	**8**	**2.3**	**-**	**-**	**10**	**-**
Leave		#	6	2	2	5	3	3	6	7	8	8	12	9	-
		%	**31.6**	**10.5**	**13.3**	**33.3**	**17.6**	**14.3**	**14.3**	**28**	**18.6**	**20**	**31.6**	**22.5**	**-**

Table 8: The retention (and graduation) rates for FTIC undergraduate Chemistry majors through fourth year, since the year 2000.

Outcomes through year 4		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	19	20	28	24	29	20	32	50	40	38	47	63	60
	%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Graduate @ FAU	#	2	4	3	5	4	5	4	8	4	5	-	-	-
	%	**10.5**	**20**	**10.7**	**20.8**	**13.8**	**25**	**12.5**	**16**	**10**	**13.2**	**-**	**-**	**-**
Graduate @ other SUS Institution	#	-	-	1	1	-	-	-	1	-	-	-	-	-
	%	**-**	**-**	**3.6**	**4.2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**-**
Persist	#	8	9	13	8	18	8	19	19	29	18	-	-	-
	%	**42.1**	**45**	**46.4**	**33.3**	**62.1**	**40**	**59.4**	**38**	**72.5**	**47.4**	**-**	**-**	**-**
Transfer to other SUS	#	5	-	-	1	1	1	1	6	3	6	-	-	-
	%	**26.3**	**-**	**-**	**4.2**	**3.4**	**5**	**3.1**	**12**	**7.5**	**15.8**	**-**	**-**	**-**
Leave	#	4	7	11	9	6	6	8	16	4	9	-	-	-
	%	**21.1**	**35**	**39.3**	**37.5**	**20.7**	**30**	**25**	**32**	**10**	**23.7**	**-**	**-**	**-**

Table 9: The graduation rates for FTIC undergraduate Chemistry majors through sixth year, since the year 2000.

Outcomes through year 6		Entering Year												
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total	#	19	20	28	24	29	20	32	50	40	38	47	63	60
	%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Graduate @ FAU	#	6	9	12	9	9	10	16	20	-	-	-	-	-
	%	**31.6**	**45**	**42.9**	**37.5**	**31**	**50**	**50**	**40**	**-**	**-**	**-**	**-**	**-**
Graduate @ other SUS Institution	#	2	-	2	2	1	1	1	4	-	-	-	-	-
	%	**10.5**	**-**	**7.1**	**8.3**	**3.4**	**5**	**3.1**	**8**	**-**	**-**	**-**	**-**	**-**
Persist	#	2	5	3	5	11	3	6	5	-	-	-	-	-
	%	**10.5**	**25**	**10.7**	**20.8**	**37.9**	**15**	**18.8**	**10**	**-**	**-**	**-**	**-**	**-**
Transfer to other SUS	#	2	-	-	1	2	1	-	3	-	-	-	-	-
	%	**10.5**	**-**	**-**	**4.2**	**6.9**	**5**	**-**	**6**	**-**	**-**	**-**	**-**	**-**
Leave	#	7	6	11	7	6	5	9	18	-	-	-	-	-
	%	**36.8**	**30**	**39.3**	**29.2**	**20.7**	**25**	**28.1**	**36**	**-**	**-**	**-**	**-**	**-**

Table 10: The four-year graduation rate for undergraduate Chemistry majors transferring from a Florida public community college (with or without an AA degree), since the year 2000.

Outcomes through year 4			Entering Year												
			2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Total		#	19	19	15	15	17	21	42	25	43	40	38	40	58
		%	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
Graduate @ FAU		#	5	11	9	5	5	14	25	9	18	12	-	-	-
		%	**26.3**	**57.9**	**60**	**33.3**	**29.4**	**66.7**	**59.5**	**36**	**41.9**	**30**	**-**	**-**	**-**
Graduate @ other SUS Institution		#	1	-	-	1	1	-	-	1	-	-	-	-	-
		%	**5.3**	**-**	**-**	**6.7**	**5.9**	**-**	**-**	**4**	**-**	**-**	**-**	**-**	**-**
Persist		#	3	6	-	1	4	-	5	2	11	7	-	-	-
		%	**15.8**	**31.6**	**-**	**6.7**	**23.5**	**-**	**11.9**	**8**	**25.6**	**17.5**	**-**	**-**	**-**
Transfer to other SUS		#	2	-	-	1	-	1	1	-	1	3	-	-	-
		%	**10.5**	**-**	**-**	**6.7**	**-**	**4.8**	**2.4**	**-**	**2.3**	**7.5**	**-**	**-**	**-**
Leave		#	8	2	6	7	7	6	11	13	13	18	-	-	-
		%	**42.1**	**10.5**	**40**	**46.7**	**41.2**	**28.6**	**26.2**	**52**	**30.2**	**45**	**-**	**-**	**-**

Table 11: The total number of BA/BS degrees in Chemistry, awarded by year, since 2001-2002. (A degree awarded with a single major contributes one degree, and a double major contributes one-half degree.)

	Year Degree Granted													All
	2001-2002	**2002-2003**	**2003-2004**	**2004-2005**	**2005-2006**	**2006-2007**	**2007-2008**	**2008-2009**	**2009-2010**	**2010-2011**	**2011-2012**	**2012-2013**	**2013-2014**	
All	26	18.5	30	31	25.5	42	26.5	37.5	27.5	43	43.5	31	49.5	431.5

xvi. Student Recruitment:

Recruitment activities include:

1) visits to local high schools by our graduate and undergraduate students and representatives form the FAU Chemistry Club, where experiments and demonstrations were conducted

2) phone calls made by faculty and staff made to admitted qualified chemistry students to encourage them to choose FAU

3) on- and off-campus activities by faculty, staff and FAU Chemistry Club to encourage undecided majors to consider Chemistry as their major

Graduate Programs

i. Limited Access:

N/A

ii. Admissions Criteria:

The admissions criteria for M.S. and Ph.D. degrees are described in the information brochures in Appendix D. The Department's graduate admissions committee prefers students who exceed the minimum requirements.

iii. Enrollment Information:

Enrollment information for graduate students is shown in Table 12. Generally, the number of full-time students in our graduate programs as declined over the last several years. We believe that this trend is due to a number of factors, including university directives to limit the number of graduate admissions due to financial problems, uncompetitive stipends, and lack of funds for recruiting activities.

Table 12: Enrollment by level (annual headcount) for Chemistry (Program CIP: 400501)

	Chemistry 2011-2012	**Chemistry 2012-2013**	**Chemistry 2013-2014***	**College Total 2012-2013**	**University Total 2012-2013**
Masters	10	13	6	228	4,675
Doctoral	30	23	26	279	927
Total	40	36	32	507	5602

*data for 2013-2014 from Departmental records

iv. Average Class Size and Faculty/Student Ratio:

Data for enrollment of students in our graduate classes is shown in Table 13. Note that these data include traditional courses as well as research and dissertation credits. Nevertheless, these data indicate a student/faculty ratio that is lower than that of the College of Science or FAU as a whole. Although this may be interpreted as a positive indicator on a pedagogical basis, we believe that it is the result of the diminishing number of students in our graduate program, which will obviously decrease the student/faculty ratios in our cases. This is not necessarily a positive trend.

Table 13: Average course section size and percent of sections taught by faculty for the Department of Chemistry and Biochemistry at the graduate level.

				2010-2011	2011-2012	2012-2013	College 2012-2013	University 2012-2013
Graduate	**Lecture/Seminar**	**Sections Offered**	**#**	11	12	11	167	1,575
			# Enrolled	81	89	64	1,386	22,406
			Avg Section Enrollment	**7.4**	**7.4**	**5.8**	**8.3**	**14.2**
		Sections Faculty-Taught	**#**	11	11	11	158	1,318
			%	**100.0**	**91.7**	**100.0**	**94.6**	**83.7**

v. Curriculum:

The curriculum for our graduate programs in Chemistry, as described in the FAU catalog, is shown below. Our formal course requirements (20 credits) are lower than some similar programs at universities in Florida (e.g., University of Central Florida: 24 credits, University of Florida: 27 credits) and elsewhere (e.g., University of Texas, El Paso: 27 credits). However, course requirements at such schools as Florida International University (18 credits) and the University of South Florida (20 credits) are similar. Our thesis, admission to candidacy, colloquium, research proposal, and thesis defense requirements are similar to those of most chemistry graduate programs in the United States.

Master of Science with Major in Chemistry

Admission Requirements

In addition to the University's general graduate admission requirements, the typical prerequisite to graduate studies in the Department of Chemistry and Biochemistry is the Bachelor of Science degree in chemistry or its equivalent. Students must have achieved a minimum 3.0 GPA in the last 60 credits of undergraduate work, a "B" average in chemistry courses taken at the junior and senior undergraduate levels, or scores of at least 150 (verbal) and 152 (quantitative) on the Graduate Record Exam.

Degree Program

Master of Science (M.S.) students will be required to complete the three core courses as well as three electives. These electives may be selected from graduate-level courses offered in the Department of Chemistry and Biochemistry or other departments in the Charles E. Schmidt College of Science. Elective courses must be approved by the student's advisory committee.

Introduction to Chemical Research	1
Core Courses	
Instrumentation	3
Synthesis and Characterization	3
Kinetics and Energetics	3
Electives	9
Graduate seminar (non-thesis)	1
Graduate seminar (thesis)	1
Master's Thesis	10
Minimum Total	**31**

Doctor of Philosophy with Major in Chemistry

The Ph.D. program in the Department of Chemistry and Biochemistry focuses on Chemical Biology and allows students to pursue a research program in all of the disciplines of chemistry.

Admission Requirements

The minimum admission requirements for the Ph.D. program in the Department of Chemistry and Biochemistry are the same as those described for the M.S. program.

Degree Program

Students will be required to complete three core courses as well as three electives. If students have completed graduate-level courses previously, they may be substituted for one or more electives at the discretion of the advisory committee. Elective courses must be approved by the student's advisory committee. Students must also complete Introduction to Chemical Research and present a seminar to the Department (1 credit each).

Core Courses	
Instrumentation	3
Synthesis and Characterization	3
Kinetics and Energetics	3

Electives	(minimum)	9
Introduction to Chemical Research		1
Graduate seminar (non-thesis)		1
Graduate seminar (thesis)		1
Dissertation research	(minimum)	25
Minimum Total		**80**

Each student's research advisory committee will have at least four members, three of whom are members of the Chemistry Ph.D. program's graduate faculty. One committee member must be from outside the Department of Chemistry and Biochemistry.

Admission to Candidacy

The Candidacy Exam must be attempted within three months of finishing all coursework and successfully completed within five months. This exam will be specifically designed for each student and will focus on the student's selected area of research. Students will be admitted to candidacy upon successful completion of the Candidacy Exam and at that time must enroll in CHM 7980, Dissertation.

In addition to presenting a proposed plan for thesis research activities to the advisory committee, students must also complete an independent research proposal in a field distinct from their thesis research. This proposal is to be completed within three months of completing the Candidacy Exam. The goal of this exercise is for the student to prepare an original written research proposal and successfully defend this orally to his/her committee. This is designed to test the student's ability to identify and design a research project, which will test problem-solving skills and ability to distill relevant literature and design appropriate experiments to address specific research questions.

Students must also write a dissertation describing their research, which must be approved by the research advisory committee. The dissertation must be successfully defended by the student in an oral exam with the research advisory committee.

vi. Internships, Practicum, Study Abroad, Field Experiences:

At the graduate level, very few of our students are involved in any of these activities. We are currently in negotiations with nearby Scripps Research Institute to establish an internship program for our graduate students at their facility.

vii. Pedagogy/Pedagogical Innovations:

Our graduate curriculum remains stable since the establishment of our Ph.D. program in 1999. However, recently we have made a strong effort to better assess oral presentations by our graduate students, including applying a standard evaluation rubric that was developed under a contract with the National Science Foundation.

viii. Scope of Institutional Contribution:

Our Department contributes as follows:

1. Many of our graduate courses are taken by students in other graduate programs, primarily in the CES College of Science. Such courses include Advanced Biochemistry, Materials Chemistry, and Instrumentation.
2. Many of our faculty serve on supervisory committees for graduate students in other programs. In particular, there is strong participation by our faculty in supervisory committees in the Integrative Biology Ph.D. program.
3. Two students in the M.S. program in Biomedical Science are currently doing their thesis research under the direction of Dr. Frank Mari in our department.
4. Our major instrument laboratory serves as a resource for researchers throughout the university, especially those in Biomedical Science and Integrative Biology.

ix. Student Profile:

Demographic data for our graduate students in shown in Table 14. Although the percentage of males and females is similar (~50% each), these data indicate that the ethnic and racial composition of students of our graduate students is much different than that of our undergraduate students. For example, while they comprise only a small percentage of our undergraduate chemistry majors, nearly half of our graduate students are non-resident aliens. Perhaps more disturbing is the extremely low number of blacks and Hispanics in our graduate program (1 each in 2011-2012 and 2012-2013), which indicates a need for improving our recruiting efforts for students in these groups. Also disturbing is the decline in the total number of students in our graduate program has declined over the last several years, due to the issues discussed earlier.

Virtually all of our graduate students are supporting by teaching assistantships, which consists of either a $12000 (M.S.) or $20,000 (Ph.D.) annual stipend and partial tuition and fee waivers. A few supplemental scholarships of $1000 or $2000 are awarded each year to outstanding first-year students.

All of our graduate students are involved in scholarly activity, such as presenting poster and oral presentations at the annual graduate student research symposium. Ph.D. students are required to have at least one manuscript on their research before graduating. Many students also present their research at regional and national meetings of professional organizations such as the American Chemical Society. The FAU student government provides funds for travel to such meetings

Table 14: Student diversity and demographics of graduate chemistry majors, compared with college and university totals.

			Chem. 2011-2012	Chem. 2012-2013	College 2012-2013	University 2012-2013
Graduate	**American Indian/Alaskan Native**	**Female**			2	11
		Male				8
		Total			**2**	**19**
	Asian or Pacific Islander	**Female**		1	14	155
		Male	1	1	13	119
		Total	**1**	**2**	**27**	**274**
	Black (Not of Hispanic Origin)	**Female**	1		10	624
		Male			20	265
		Total	**1**		**30**	**889**
	Hispanic	**Female**			27	495
		Male	2	1	25	318
		Total	**2**	**1**	**52**	**813**
	White (Not of Hispanic Origin)	**Female**	12	12	158	1,926
		Male	6	4	143	1,233
		Total	**18**	**16**	**301**	**3,159**
	Non-Resident Alien	**Female**	6	3	38	177
		Male	8	9	53	200
		Total	**14**	**12**	**91**	**377**
	Not Reported	**Female**			4	41
		Male				30
		Total			**4**	**71**
	Total	**Female**	19	16	253	3,429
		Male	17	15	254	2,173
		Total	**36**	**32**	**507**	**5,602**

x. Advising Procedures:

Upon entering either our M.S. or Ph.D. program, students are initially advised on course selection and other procedures by our Graduate Admissions Committee, which consists of four faculty members from a variety of sub-disciplines. First-year students are also required to take the course "Introduction to Research" where they receive instructions on procedures for choosing a research advisor and ethical conduct of research. After students choose a research advisor, they receive advice from their supervisory committee, which consist of three (M.S.) or four (Ph.D.) members chosen from among the graduate faculty.

xi. Licensure Rates (if applicable):

N/A

xii. Placement Rates/Employment Profile:

The Department of Chemistry and Biochemistry does not collect or receive placement data for undergraduate Chemistry majors. However, we aware that many of our M.S. and Ph.D. graduates have obtained excellent positions both in South Florida and elsewhere, including pharmaceutical companies, government regulatory agencies and the aerospace industry. In particular, several of our Ph.D. graduates have obtained excellent faculty positions at local colleges and universities such as Nova Southeastern University, Barry University, and Palm Beach Atlantic College.

xiii. Retention Rates:

Very few students leave our graduate program without receiving their degrees. In the last five years, only three students have withdrawn without receiving their chosen degrees.

xiv. Graduation Rates:

The number of graduate degrees awarded in the past several years is shown in Table 15. The number has declined since 2006-2007, mainly as a result of a reduction in the size of our graduate programs.

Over 90% of our students receive their chosen degrees. Average times to graduation are 3 years for M.S. students and 5.5 years for Ph.D. students.

Table 15: Number of graduate degrees in Chemistry awarded per year

	Year Degree Granted													All
	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	
Degree Level														
Masters	7	2	5	8	7	9	5	1	3	2		5	5	59
Doctorate		1	1	2	6	7	6	5	2	3	6	2	2	43
All	7	3	6	10	13	16	11	6	5	5	6	7	7	102

xv. Student Recruitment

Students are recruited to our programs by postings on our departmental website and faculty visits to local universities and colleges. In the past, the department has also had recruiting booths at regional and national meetings, but this activity has diminished recently due to lack of funds. We also recruit FAU undergraduate students at the annual Graduate School Fair and personal interactions.

Faculty

i. Administrative Structure:

The department is led by the Chair, who is appointed by and reports to the Dean. An Associate Chair handles many administrative activities, coordinates undergraduate student advising and course scheduling. The graduate program is managed by a faculty member who serves as Chair of the department's Graduate Programs Committee.

The Chair and Associate Chair are assisted by the office staff, consisting of a Special Assistant (who also assists the graduate programs chair), a Program Coordinator, and a Budget Manager. In addition, a recently-hired Instrumentation Specialist maintains all scientific instruments and also serves as the department's safety officer and property manager. Finally, a Senior Laboratory Technician maintains the Chemical Stockroom and arranges for purchase of any necessary chemicals and equipment.

ii. Faculty Profile:

As of 2012-2013, the department had 16 faculty members. Five held the rank of full Professor, three at Associate Professor, three at Assistant Professor, three at Instructor (non-tenure earning) and two at Scientist (also non-tenure earning). In 2013, one of the full Professors, Dr. Cyril Parkanyi, passed away, and in 2014, a new Assistant Professor, Dr. Mare Cudic, was hired. We also hired a Visiting Instructor, Dr. Tito Sempertegui, in 2014. In addition, a new Chair and Professor, Dr. Gregg Fields, will be joining the department in early 2015. Even with all these changes, the number of faculty in the department has not exceeded 18 in the last 10 years, in a period of rapidly increasing student enrollment.

Table 16 shows demographic data for the faculty of the department. Unfortunately, the degree of racial diversity of the faculty does not correspond to that of undergraduate chemistry majors or that of FAU students as a whole. However, what is not shown in this table is the diversity of countries of origin of our faculty and staff. These include Australia, Columbia, New Zealand, Venezuela, Croatia, Puerto Rica, France, China, Trinidad and Tobago, Jamaica, and the United States.

If the faculty are classified according to the traditional areas of Chemistry on the basis of their most recent teaching assignments, the following breakdown of our faculty can be made:

- Analytical Chemistry: Haky, Louda
- Biochemistry: Mari, Du, Haces, Cudic
- Organic Chemistry: Lepore, West, Roche, Rezler, Chamely-Wiik
- Physical Chemistry: Terentis, Snyder
- Inorganic Chemistry: de Lill
- General Chemistry: Huchital, Ande, Carraher, Sempertegui

On the basis of this breakdown, it is clear that the department has sufficient diversity to teach courses in all the traditional areas of chemistry. However, it does not have sufficient numbers to keep up with increasing student enrollment, especially in the lower division courses.

Table 16: Demographic data for faculty in the Department of Chemistry and Biochemistry

Instructional Faculty (Tenured, tenure-earning, & non-tenure-earning)		Chemistry			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
American Indian/Alaskan Native	**Male**					1
	Total					1
Asian or Pacific Islander					1	1
	Female				7	28
	Male	3	3	2	15	78
	Total	3	3	2	23	107
Black (Not of Hispanic Origin)						1
	Female				1	30
	Male				3	18
	Total				4	49
Hispanic					1	1
	Female				3	34
	Male	2	2	2	4	23
	Total	2	2	2	8	58
White (Not of Hispanic Origin)			0		0	3
	Female	4	3	2	23	276
	Male	9	10	10	86	382
	Total	13	13	12	109	661
Total			0		2	6
	Female	4	3	2	34	368
	Male	14	15	14	108	502
	Total	18	18	16	144	876

iii. Faculty Teaching Load:

Teaching loads vary from 1-3 courses per semester, depending on the levels of research and service activities with which the faculty are involved. Not included in these assignments are directed independent study, advanced research, and thesis and dissertation credits. Our three instructors generally have the highest teaching loads; for example, one of them (Mr. Ande) supervises 50-60 introductory chemistry lab classes per semester, with the help of teaching assistants, while another (Dr. Huchital) teaches 2-3 introductory chemistry sections per term, with enrollments exceeding 340 students each.

Overall, the goal is no more than two courses per semester for each tenure-track faculty member and 3-4 courses per semester for non-tenure–track faculty member, but there are reductions in some cases. The Chair and Associate Chair are assigned one course per term, as are first year tenure track faculty. Faculty with significant research grants (e.g., Dr. Lepore, Dr. Rezler) are frequently given a one course reduction per semester. Tenure-track faculty who teach large lower-division courses (e.g., Drs. Roche and West) are given a one-course reduction each semester. In addition, Dr. Chamely-Wiik has been relieved of all teaching duties for the last two years in order to concentrate on developing FAU's Quality Enhancement Plan (QEP), which she leads.

Table 17 below provides additional information. The data in this table indicates a rapid increase in the teaching demands on the faculty over the last several years, exceeding that the college in the last year that data is available.

Table 17: Annualized FTE produced per instructional person per year.

	Chemistry			College Total	University Total
	2010-2011	**2011-2012**	**2012-2013**	**2012-2013**	**2012-2013**
Undergraduate	18.2	17.7	21.0	19.4	19.1
Graduate	0.9	0.8	0.8	1.1	2.8
Total	**19.1**	**18.5**	**21.8**	**20.5**	**21.9**

iv. Summary of Faculty Research Productivity:

Faculty research productivity is discussed in section D below.

v. Strategic Planning for Hires:

Based on recent faculty publications and external grants, most of the research and creative activity among the faculty can be classified according into two broad areas:

1. **Chemical Biology:** the application of chemistry to solve biological problems.
2. **Chemical Education:** the development of methods and techniques for improving and assessing student understanding of chemistry.

Given the small size of the department, it seems judicious that new faculty should be hired to compliment the interests and activities of the current faculty in these areas. However, consideration must also be given to the teaching needs of the department, given the rapid growth of enrollment in undergraduate chemistry classes, particularly at the lower division. Additionally, space limitations in our buildings must be considered, as there is little unoccupied research or teaching laboratory space available in our department.

The recent hiring of our new chair Dr. Gregg Fields brings with it a commitment by the administration for hiring three additional faculty on the Boca Raton campus. Based on the considerations discussed above, and with Dr. Fields' concurrence, we believe that the first two of these new faculty should be in the basic areas of physical chemistry and organic chemistry. To compliment the current faculty, we would try to recruit a physical chemist with expertise in computational chemistry, more specifically chemoinformatics. Analogously, we would recruit an organic chemist who would focus on chemical education. The area of focus for the third new position, to be hired in a few years from now, will remain open for now, and will be considered based on the future needs of the department. In any event, to balance the distribution of faculty levels, we will try to recruit an individual for at least one of these positions at the Associate Professor level, who would have existing external funding.

Our university's President, Dr. John Kelly, has proposed the construction of a new $28 million Science Building and the establishment of an honors program in Science, Technology, Engineering and Mathematics (STEM) on the Jupiter campus, with an enrollment of 3000 students. Although specific planning for this program awaits approval by the state, we are already considering possible chemistry faculty for this program. Such faculty would most likely include adjuncts from the Scripps Research Institute and the Max Planck Institute, two renowned organizations located on that campus.

vi. Abbreviated Faculty CVs:

Faculty CV's are included in Appendix E.

D. Research

i. Review of Part II of the Department Dashboard Indicators:

Of the information in part II in the Department Dashboard Indicators (DDIs), the most informative is shown in Table 18, which summarizes research productivity in terms of a variety of indicators. Unfortunately, most of these indicators show significant reductions in research productivity, including substantial declines in number of peer-reviewed papers published, presentations made at professional meetings, and sponsored research expenditures. Reasons for this decline are numerous, but certainly include reductions in the success rate for external grant applications caused by overall budget cuts in federal programs. Still the faculty keeps trying, as indicated by the increases in grant proposals submitted over the last several years. Additionally, we expect that our research productivity will significantly increase in our department, owing to the recent hiring of such new faculty as Dr. Mare Cudic, who was awarded a grant from NIH within three days of being hired, and our new chair, Dr. Gregg Fields, who has a long track record of publications in outstanding journals and success in obtaining external funding.

Table 18: Departmental research activities for faculty in Chemistry

		Chemistry			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Books (including monographs & compositions)	#	1	2	2	22	146
2. Other peer-reviewed publications	#	20	19	12	229	1,161
3. All other publications	#	10	9	5	31	501
4. Presentations at professional meetings or conferences	#	20	12	8	308	1,435
5. Productions/Performances/Exhibitions	#	1	1	1	36	377
6. Grant Proposals Submitted	#	11	12	18	109	385
Sponsored Research & Program Expenditures						
7. Organized Research	#	$661,650	$409,498	$315,272	$8,625,887	$15,603,749
8. Sponsored Instruction	#	$358,409	$180,504	$141,055	$1,242,409	$6,138,254
9. Other Sponsored Activities	#	$428,257	$408,746	$52,139	$620,037	$2,565,166

ii. Interdisciplinary Efforts:

There are very strong, collaborative interdisciplinary research projects underway in this department. Shown below are brief descriptions of such projects, as submitted by current faculty:

Dr. Charles Carraher

Dr. Carraher collaborates with *Dr.Michael Roner*, University of Texas Arlington, Department of Biology. In this project Dr. Roner does the biological studies on inhibition of cancer cells and viruses and Dr. Carraher the structural characterization and synthesis.

Dr. Donna Chamely-Wiik

Dr. Chamely-Wiik is Principal Investigator of a $2.5 million grant from the National Science Foundation, "Project ChemBOND: The Next Generation" which involves placing FAU graduate students from various scientific disciplines to work with students in chemistry and environmental science students classes in local high schools. She works closely in this project with co-PI's *Dr. Jerome Haky (Chemistry), Dr. Deborah Louda (College of Medicine), and Dr. Nancy Romance (College of Education)*.

Dr. Chamely-Wiik was co-PI of an NSF-sponsored project to develop an honors writing-intensive introductory chemistry course with Principal Investigator *Dr. Jerome Haky* (Chemistry) and *Dr. Jeffrey Galin* (Department of English).

Dr. Chamely-Wiik is currently collaborating with Faculty at the University of Central Florida (Biologist *Dr. Kimberly Schneider*) and Western Carolina University (*Provost Alison Morrison-Shletlar*) on an NSF Grant (IUSE) involving engaging FTIC and Transfer students in a cohort-based undergraduate research program to evaluate the impact on retention and student success.

Dr. Mare Cudic

A multidisciplinary team to study functional consequences of specific glycosylation changes. All collaborators are well respected world-wide in their area of expertise, and their combined expertise in the area of drug discovery will ensure translational significance.

Dr. Jesús Jiménez-Barbero (Centre for Biological Research, Madrid, Spain) will perform NMR studies of the conformation and dynamics of the molecular recognition processes between tumor-associated MUC1 glycopeptides and galectin-3.

Dr. Karina Martínez-Mayorga (Universidad Nacional Autónoma de México, Department of Physical Chemistry, Mexico City, Mexico) will perform molecular modeling studies.

Prof. Hans-Joachim Gabius (Ludwig-Maximilians-University, Munich, Germany) will perform binding studies with tumor-associated MUC1 glycopeptides and C-type macrophage Gal/GalNAc specific lectin and *Viscum album agglutinin* (VAA), a potent inducer of cell apoptosis.

Dr. Barbara Mueller (San Diego Biomedical Institute, San Diego, CA) is a cancer biology collaborator. She will study the ability of glycopeptides that interfere with MUC1-lectin binding to inhibit metastasis in a mouse model of breast metastatic cancer.

Dr. Olivera Finn (University of Pittsburgh, Chair, Department of Immunology, Pittsburgh, PA) will collaborate on studies aimed at development of new therapeutic strategy for metastatic cancer that would combine the MUC1-based cancer vaccine and anti-galectin therapy.

Dr. Dmitriy Minond (Torrey Pines Institute for Molecular Studies, Port St. Lucie, FL) will provide his expertise in development of HTS screening assays.

Dr. Gregg B. Fields (Torrey Pines Institute for Molecular Studies, Port St. Lucie, FL) will provide his expertise in the area of matrix metalloproteinases (MMPs) and their ability to process galectins.

Dr. Xupei Huang (Florida Atlantic University, College of Medicine, Boca Raton, FL) will collaborate on the potential therapeutic effects of galectin-3 inhibitors on heart disease and heart failure.

Dr. Daniel de Lill

Collaborators include:

Dr. Raphael Raptis, FIU: Dr. Raptis collects single crystal X-ray diffraction data at FAU.

Dr. Benny Chan, The College of New Jersey: Dr. Chan collects single crystal X-ray diffraction data for our lab. We currently have two publications together, plus one in submission and several in preparation.

Dr. Ralph Zehnder, Angelo State University: The de Lill lab conducts thermal analyses of Dr. Zehnder's materials. He has presented our collaboration at several ACS meetings.

Dr. Andrew Terentis, FAU: The Terentis and de Lill groups work on the synthesis and characterization of nanomaterials for use in the bioimaging of cardiovascular disease. An American Heart Association grant proposal and R15 grant proposal are in preparation for submission in January and February 2015, respectively.

Drs. Deguo Du, Hassan Mahfuz (Engineering), and Kevin Kang (Engineering) of FAU are currently preparing to submit a NSF MRI for January 2015 to obtain a SEM for FAU.

Dr. Karah Knope, Georgetown University. Dr. Knope works with the de Lill group in the synthesis and characterization of nanomaterials for use in oxygen storage and delivery. We are currently preparing a DoD grant proposal together.

Dr. Degua Du

Dr. Deguo Du in FAU chemistry is collaborating with biophysicist *Dr. Ewa Wojcikiewicz* in our medical school in studying morphology and aggregation dynamics of amyloidogenic proteins.

Dr. Jerome Haky

Dr. Haky (Associate Chair) is involved in a wide variety of interdisciplinary projects related to Chemical Education. See entries for *Drs. Chamely-Wiik and Rezler*.

Dr. Salvatore Lepore

1. S. D. Lepore received a $311,000 grant (2014-2017) as PI from the NIH with *D. Minond* (consultant) Assistant Member at Torrey Pines Institute of Molecular Studies. The project was entitled "Synthesis of a Bridged Bicyclic Natural Product Using Allenyl Esters".

2. S. D. Lepore received a $650,000 grant (2010-2013) as PI from the NIH with *V. W. Pike* (consultant) Director of PET at the National Institute of Mental Health in Bethesda, MA. The project was entitled "New Methods for the Expedited Synthesis of C11 and F18 PET Tracers". Their collaborative efforts have resulted in several high-profile scholarly publications.

3. S. D. Lepore received a $100,000 grant (2011-2012) as PI from the American Chemical Society with *J. W. Louda* (coPI) of the FAU Department of Chemistry and Biochemistry. The project was entitled "Elucidation of Reactions Mediated by Sulfidic Carbonate and Clay Depositions: the Search for New Organic Reactions Mediated by Natural Materials".

4. S D. Lepore published the results of a collaborative project in 2010 with *G B. Fields* at the Department of Biochemistry, University of Texas Health Science Center, San Antonio, TX. The paper, published in Peptide Science and was entitled "Efficient Synthesis of Fmoc-Protected Phosphinic Pseudodipeptides: Building Blocks for the Synthesis of Matrix Metalloproteinase Inhibitors."

5. S D. Lepore submitted a joint proposal to the NIH (as PI) with *H. Huang* (coPI), Co-director of the PET Center at Yale University.

6. S. D. Lepore received a $20,000 grant (2009-2010) from a local Florida biotech company (*Unison Pharmaceuticals*). The project was entitled "Identification of Active Compounds in Treated Calendula Extracts".

Dr. J. William Louda

Dr. J. W. Louda's research involves environmental biogeochemistry and has included, amongst others, such efforts as; (a) pigment-based chemotaxonomic evaluation of Everglades periphyton ($240,000 contract from South Florida Water Management District in collaboration with *Dr. Scot Hagerthey*, presently at the EAP in Washington D.C.) and a chapter covering those studies is in press in 2014; (b) co-PI with *Dr. S. Lepore* on an $ 100,000 ACS grant to study organic reaction mechanisms that mimic those found by Louda in anoxic marine carbonate marl sediments; (c) Co-PI with *Dr. B.E. Lapointe* of FAU-Harbor Branch Oceanographic Institution on a $ 20,000 FAU Seed grant to study nitrogen and phosphorus pollution of the Indian River Lagoon by septic tank effluents; (d) PI/PD on a $ 25,000 NSF-FSML Planning Grant for the upgrade of the *Cape Eleuthera Institute laboratories* on the island of Eleuthera in the Bahamas. Co-PIs on that project were *Dr. B.E. Lapointe {FAU-HBOI}, Dr. D. Philipp {U. Ill.} and Mr. A. Shultz {CEI-Bahamas}*; (e) Worked on a $ 8,000 Fulbright Specialist Award to visit, give talks and perform research on marine pollution at the *Polish Academy of Sciences (IOPAN)*, Sopot, Poland; and (f) PI/PD on a $14,000 Department of the Interior grant to

compile a 'spatiotemporal biogeochemical database' including all published and white paper information on mercury and methylmercury in the Everglades.

Dr. Frank Mari

Collaborators include:

Tanja Godenschwege, Department of Biological Science, FAU

Dr. Mari at FAU Chem & Biochem received a $400,000 grant from NIH with Neurobiologist Dr. Tanja Godenschwege in our Biology department on screening peptidic natural product in Drosophila". They have also published 4 papers on the subject.

David J. Adams, RMIT University, Melbourne, Australia

Dr. Mari at FAU Chem & Biochem received a $1,200,000 grant from Australian Research Council with Physiologist Dr. David J. Adams from the Health Innovations Research Institute at RMIT University on screening novel conotoxins for inhibitory activities on the nicotinic acetylcholine receptor. They have also published 2 papers on the subject.

Paul F. Alewood, Institute of Molecular Biosciences, University of Queensland, Australia

Dr. Mari at FAU Chem & Biochem and Dr. Paul Alewood from the Institute of Molecular Biosciences, University of Queensland, Australia, collaborate on the synthesis of novel marine compounds that have significant pharmacological value. They recently published a paper in the prestigious journal Biochemical Pharmacology.

Elizabeth Swartz, Department of Physiological Sciences, University of Brasilia, Brazil

Dr. Mari at FAU Chem & Biochem and Dr. Elizabeth Swartz, Department of Department of Physiological Sciences, collaborate on the functional characterization venom components expressed by spiders and scorpions. They recently published a paper in the prestigious journal Biochemistry (ACS).

Jan Tytgat, Laboratory of Toxicology, University of Leuven, Belgium

Dr. Mari at FAU Chem & Biochem and Dr. Jan Tytgat, Laboratory of Toxicology, University of Leuven, Belgium, collaborate on the chemical and functional characterization of venom components expressed by marine organisms. They recently published four papers in various high caliber journals

Dr. Evonne Rezler

Dr. Rezler is Principal Investigator of a $200,000 grant from the National Science Foundation to incorporate Raman Spectroscopy throughout the undergraduate Chemistry curriculum. She is working with co-PI's *Dr. Andrew Terentis* and *Dr. Jerome Haky* (Chemistry) and consultants *Dr. Nancy Romance* (College of Education) and *Dr. Robert Potter* (University of South Florida).

Additionally, Dr. Rezler is currently collaborating with *Dr. Rodney Murphy* and colleagues in the Department of Biological Sciences at FAU, on an NSF Grant (IUSE) involving introduction of novel *in silico* learning approaches to large classes in biology and assessment of student learning. Dr. Rezler will serve as the assessment consultant for that grant if funded.

Dr. Stephane Roche

Network of collaborators for biological testing

Professor Pelletier at McGill University (Canada) is involved in protein synthesis inhibition (eIf4A) related to novel strategies against cancer.

Professor Inglese, Director of NIH center NCATS is involved in drug discovery for rare diseases.

Dr. Ken Dawson-Skully at FAU is involved in small-molecule library screening and behavioral assays on drosophila in relation with neuroprotection.

Dr. Dmitriy Minond at Torrey pines is involved in small-molecule library screening against cancer and metalloprotein inhibitors.

Eli Lilly (Open Innovation Program) drug discovery (pre-clinical phases)

Network of collaborators for Chemical Methodology Advancement:

Professor Jacobsen, Chair of the Chemistry Department at Harvard University, is involved in the asymmetric synthesis of non-proteinogenic amino acids.

Dr. Adam Alty, Director of R&D at Synquest (Florida) is involved in developing new reagents for a de novo peptide coupling method using protecting group free amino acids.

Dr. Andrew Terentis

Collaborators include:

Dr. Daniel de Lill, FAU Chemistry and Biochemistry: The Terentis and de Lill groups work on the synthesis and characterization of nanomaterials for use in the bioimaging of cardiovascular disease. An American Heart Association grant proposal and R15 grant proposal are in preparation for submission in January and February 2015, respectively.

Dr. Deguo Du, FAU Chemistry and Biochemistry: The Terentis group performs Raman spectroscopy experiments studying morphology and aggregation dynamics of amyloidogenic proteins for the Du group. A co-publication is currently under revision with the Journal of Physical Chemistry Letters.

Drs. Gregg Fields, *Marè and Predrag Cudic, Maciej Stawikowski*, Torrey Pines Institute for Molecular Studies and FAU Chemistry and Biochemistry: provide peptide synthesis expertise (past and present) for Dr. Terentis research on cell penetrating peptides. A notable collaborative paper was published in JACS (2010).

Dr. Hassan Mahfuz, FAU Department of Ocean & Mechanical Engineering: The Terentis group performs Raman spectroscopic studies and syntheses of novel polymer-carbon nanomaterial composites for the Mahfuz group.

Drs. Evonne Rezler and Jerry Haky, FAU Chemistry and Biochemistry: Drs. Rezler, Haky and Terentis are co-investigators for a $200,000 grant from the National Science Foundation to incorporate Raman Spectroscopy throughout the undergraduate Chemistry curriculum.

Dr. John Strasswimmer, Lynn Cancer Institute, Boca Raton, and FAU College of Medicine: Dermatologist and Mohs surgeon Dr. John Strasswimmer provides skin cancer specimens for Dr. Terentis' ongoing research on the use of Raman spectroscopy to diagnose and treat skin cancers. A paper was recently published together and highlighted as the Editor's Choice (December 2014) in the international journal Lasers in Surgery and Medicine.

Dr. Shane Thomas, University of New South Wales: Dr. Thomas provides recombinant human Indoleamine 2,3-Dioxygenase (IDO) samples and molecular and cell biology expertise for Dr. Terentis' ongoing research on the structure and function of IDO. Several papers have been published together as a result of this collaboration, including a paper in the Journal of Biological Chemistry in 2013.

Dr. Kallidaikurichi V. Venkatachalam, Nova Southeastern University, College of Medical Sciences: Provides recombinant protein samples for structure-function studies of L-Methionine γ-Lyase from Porphyromonas gingivalis.

Ewa Wojcikiewicz, FAU College of Medicine: The Terentis and Wojcikiewicz groups collaborate on a project entitled "Biophysical and Biochemical Determinants of Cell Adhesion and Migration". Terentis and Wojcikiewicz were the recipients of an FAU College of Science Seed Grant for this project (2014-15) and recently submitted an R15 proposal for this project to the NIH.

Dr. Gregg Fields

In addition, our incoming chair, Dr. Gregg Fields, lists these multidisciplinary efforts:

Barry Edwards, University of Pittsburgh, PA. Development of imaging agents for visualization of matrix metalloproteinase 2 and matrix metalloproteinase 14 activities in vivo.

John Hart, University of Texas Health Science Center, San Antonio, TX. X-ray crystallographic analysis of MMP-13/inhibitor complexes.

Rikard Holmdahl, Karolinska Institute, Stockholm, Sweden. Collagen epitope mapping in rheumatoid arthritis.

Thomas Kodadek, Scripps Florida, Jupiter, FL. Screening matrix metalloproteinase 14 with conformationally constrained combinatorial chemical libraries.

Claudio Luchinat, University of Florence, Florence, Italy. NMR structural characterization of matrix metalloproteinase-substrate and -inhibitor complexes.

Linda Malkas, City of Hope Cancer Institute, Duarte, CA. Development of novel peptides for treatment of brain cancer.

William Roush, Scripps Florida, Jupiter, FL. Medicinal chemistry modification of matrix metalloproteinase probes.

Irit Sagi, The Weizmann Institute, Tel Aviv, Israel. Spectroscopic characterization of matrix metalloproteinase-substrate and -inhibitor complexes.

Michael Selsted, University of Southern California, Los Angeles, CA. Theta-defensins as novel metalloproteinase inhibitors.

Alex Strongin, The Sanford Burnham Research Institute, La Jolla, CA. Analysis of matrix metalloproteinase 14 cell surface activity.

Steven Van Doren, University of Missouri, Columbia, MO. NMR structural characterization of matrix metalloproteinase-substrate complexes.

Stephen Weiss, University of Michigan, Ann Arbor, MI. Analysis of matrix metalloproteinase 14 cell surface activity.

iii. Establishment of Goals for Research:

As reported in the FAU Assessment Database, our goals for our research program consist of:

Goal 1, at least 50% of full-time faculty publishing or having accepted for publication at least 1 article, book or chapter in an appropriate outlet per academic year,

Goal 2, at least 50% of full-time faculty presenting at least one poster or paper at a professional meeting per academic year, and

Goal 3, at least 50% of full-time faculty obtaining funding for research over a three year period.

iv. Assessment of How Well Goals are Being Met:

Faculty in our Department have consistently met Goal 1 but have had difficulties meeting Goals 2 and 3 in the last several years. Although, there are many reasons for this, among the most significant is our general failure to obtain external funding for research (Goal 3). This in turn has led to reduced resources for travel to meetings to make presentations (Goal 2). The preferred solution to these problems is a greater success rate for obtaining external grants. This may be possible now that the recently hired faculty are now writing more grant proposals which have more preliminary results with greater possibility of being funded. In addition, our more established faculty have re-doubled their efforts to produce data and like-wise obtain extramural funding.

E. Service/Community Engagement for Department/School

i. Community Engagement

Community outreach activities in the department are numerous and diverse. They include the following:

The FAU Chemistry Club:

The FAU Chemistry Club was revived by Dr. Evonne Rezler together with some very enthusiastic organic chemistry students in Summer 2008. In 2014, Dr. Tito Sempertegui became co-advisor with Dr. Rezler. The FAU Chemistry Club has been an ACS Chapter since 2010. During that time the Club has achieved the following ACS awards:

2010-2011 Commendable Award
2011-2012 Certificate of Achievement
2012-2013 Honorable Mention Award and Green Chemistry Chapter
2013-2014 Commendable Award and Green Chemistry Student Chapter

The Club has a website which is maintained by the faculty advisor and the Club President. The website showcases all club outreach activities:
http://www.science.fau.edu/chemistry/faculty/FAU%20Chemistry%20Club/

Since its inception the Club has organized and/or participated in some high profile events including:

1. *The FAU Chemistry Club Annual Research Symposium and Banquet*: This is an occasion that allows chemistry students to network with their peers and faculty from the Department and other institutions. Each year we have had up to three faculty research presentations and in recent years students have presented research posters. Students present research posters in undergraduate and graduate categories and these are judged by a faculty and student panel. The best posters win awards, up to $150 per award.

2. *2014 Crystal Growing Competition*: 2014 is designated as the "International Year of Crystallography" and the FAU Chemistry Club has organized a crystal growing competition in Fall 2014. The competition was open to all middle- and high-schools in our region. Faculty and Club Executive members served as judges of the quality and size of copper sulfate crystals grown by each team. Details can be found at: http://www.science.fau.edu/chemistry/faculty/FAU%20Chemistry%20Club/index_cgc.html

3. *Battle of the Chemistry Clubs in South Florida*: In 2013 the FAU Chemistry Club applied for and received a competitive and peer-reviewed Inter-Chapter Relations grant from the ACS, valued at $500 to host the inaugural Battle of the Chemistry Clubs in the South Florida region. In May 2014, the FAU Chemistry Club hosted Nova Southeastern University (NSU) Chemistry Club. The two ACS Chapters battled for champion standing in a series of events including: 1) Spectroscopy Challenge, 2) Periodic Table Darts Competition, and 3) Jeopardy Challenge. An awards ceremony was held to close proceedings and the FAU Chemistry Interim Chair, Dr. Jerome Haky officiated and conferred prizes. The FAU Chemistry Club learnt a great deal from this event and in Fall 2014 we applied for another Inter-Chapter Relations grant from the ACS to host this event again in April 2015. This time we have invited the Barry University Chemistry Club, expanding the competition by one as per our initial plans. We are awaiting ACS approval for this grant application.

4. *ACS National Chemistry Week at the Museum of Discovery and Science*: We have participated in this event for the last few years, holding hands on demonstration and discussing "fun science facts" with community participants of this event.

5. Science *Olympiads*: Every Spring, FAU holds the Regional Science Olympiad for Middle and High School students. Since 2009 the FAU Chemistry Club has assisted in this Olympiad by designing, running, and judging three events. These three events were Technical Problem Solving, Experimental Design, and Material Sciences. Additionally, in Spring 2014 FAU hosted an inaugural Elementary School Science Olympiad. The

FAU Chemistry Club was instrumental in organization and institution of all events at this Olympiad. Many of our faculty have also been involved in the Science Olympiads.

6. ***Science Demonstrations at Schools and at FAU***: The FAU Chemistry Club has had an on-going partnership with several elementary, middle- and high-schools in our area. We have showcased chemistry experiments every year at these schools since 2012. Also, in 2009 and 2010, we carried out spectacular chemistry demonstrations (involving liquid nitrogen) in selected lecture courses in the chemistry curriculum.

Project ChemBOND: The Next Generation

Under a $2.5 million grant from the National Science Foundation, Drs. Donna Chamely-Wiik and Jerome Haky, working with Dr. Deborah Louda (College of Medicine) and Dr. Nancy Romance (College of Education) and are completing a 7-year project which placed graduate students in local high school chemistry classes in Palm Beach County. The graduate students visited these classes twice per week and assisted the teachers with a variety of activities, including labs and demonstrations. They also discussed their research and career goals with the students, thereby improving their communication skills. Over the grant period, the project involved 20 graduate students from a variety of science disciplines, 30 teachers from 5 different schools, and over 1000 high school students. The project generated over 20 presentations at national meetings (mainly by the graduate students and teachers) and a recent manuscript in the *Journal of Chemical Education*.

Other Outreach and Community Service Activities:

Drs. Bill Louda and Evonne Rezler have served as judges at the Regional Science Fair. Dr. Evonne Rezler has served and still serves as an ACS Science Coach at local schools in Boca Raton in 2011-12, 2012-13, and currently in 2014-2015. The ACS Science Coach Program goals are for chemist-teacher partnerships to enhance science classrooms in fun and engaging ways. Dr. Rezler also serves on the Palm Beach County STEAM Advisory Board.

The FAU Chemistry and Biochemistry Department provides faculty and resource support annually for the Regional Science Olympiads held in Spring at FAU. Specially, Mr. Patrick Ande, Director of General Chemistry Laboratories, has volunteered to prepare lab space, chemicals and equipment, develop and judge events, and carry out coordination duties as needed at the Science Olympiads every year since he joined the Department.

ii. Review of part III of the departmental dashboard indicators for Department/School

Service activities of our faculty are summarized in Tables 19 and 20. Although declining somewhat in recent years, the Department's record of service is still good as a whole, with an average of almost one membership on departmental, college, and university committees each year per faculty member. Additionally, two faculty are members of community and professional committees and about half have served as referees for professional publications.

Table 19: Chemistry faculty service activities.

		Chemistry			College Total	University Total
		2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Faculty memberships on department, college or university committees	#	16	10	10	273	2,348
2. Faculty memberships on community or professional committees	#	3	2	2	69	972
3. Faculty serving as editors or referees for professional publications	#	10	8	8	96	611

Table 20: Chemistry faculty service activities

	Chemistry			College Total	University Total
	2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
1. Faculty memberships on department, college or university committees per faculty member	1.3	0.8	0.9	2.6	3.7
2. Faculty memberships on community or professional committees per faculty member	0.3	0.2	0.2	0.6	1.5
3. Faculty serving as editors or referees for professional publications per faculty member	0.8	0.7	0.7	0.9	1.0

iii. Establishment of goals for service

As reported in the FAU Assessment Database, our goals for our service program consist of:
Goal 1, at least 50% of full-time faculty being active in the service activities of professional organizations and associations each academic year,
Goal 2, at least 50% of full-time faculty being active in the service activities of the university and college, and
Goal 3, 100% of full-time faculty being active in the internal and external service activities of the department.

iv. Assessment of how well goals are being met

While the first two service goals have consistently been met, the Department has come short in the third, owing to the non-participation of some faculty in the service activities of the Department. These faculty will need to be encouraged to engage in such activities in the future.

F. Other Program Goals

i. Describe and assess how well goals are being met:

A major additional goal of the department has been the recruitment of outstanding faculty. Thanks to support from the CESCoS and the Division of Research, this goal has been met. In the past six years, the following faculty have been recruited to the department, mainly as replacements for faculty who have retired or resigned:

- Dr. Stephane Roche, an organic chemist who is working on new methods for creating novel pharmaceutical compounds.
- Dr. Daniel de Lill, an inorganic chemist who is working on self-assembled lanthanide compounds.
- Dr. Deguo Du, whose research focuses on mechanisms of protein folding, which has implications for the treatment of neurological diseases such as Alzheimer's disease.
- Mr. Patrick Ande, who is successfully supervising more than 50 introductory chemistry labs each semester.
- Dr. Mare Cudic, whose research with glycoproteins has already generated significant funding from NIH.

In addition, and perhaps most importantly, we have recruited Professor Gregg Fields, who will assume the Chairmanship of our Department in early 2015. Having served as Chair previously, he now returns with a record of even greater accomplishments in research in the areas of proteomics and drug design. He brings with him over $2,000,000 in grant funding, mostly from the National Institutes of Health (NIH). As discussed earlier, he has a strong record of collaborations with researchers throughout the country and has a special relationship with the prestigious Scripps Institute on our Jupiter campus, where he will have a joint appointment. The return of Professor Fields as Chair is a significant point in our department's history that may have impact for years to dome.

G. Strengths and Opportunities that Support Achievement of Program Goals

At the ***undergraduate program level***, strengths and opportunities of our program include the following:

- Highly qualified faculty teach all levels of undergraduate chemistry and biochemistry courses.
- Innovative conceptually based peer learning initiatives developed through the ChemBOND project are currently instituted in the introductory and organic chemistry courses. These have been shown to improve student learning and student grades.
- Undergraduate laboratory courses offer students real experience in spectroscopic techniques (as opposed to virtual labs only) such as NMR, IR, Raman spectroscopy and others. This is a direct result of establishing a state of the art core facility in the Department and the acquisition of new instruments through internal and external grants.
- The National Science Foundation (NSF) and other agencies have awarded several grants to Department faculty for innovative undergraduate chemistry education initiatives.
- Our lower division undergraduate courses have experienced large enrollment growth and have yielded a significant number of high quality students that have been accepted to various professional schools or doctoral programs.
- The American Chemical Society (ACS) has certified our undergraduate courses and programs.

At the ***graduate and research levels***, our strengths and opportunities include the following:

- Strong individual faculty members have good publishing record in superior journals.
- High quality graduate students have gone on to prestigious post-doctoral training and other employment.
- The NSF GK-12 Program, funded at $2.5 million, enabled graduate students to work with local high school students and teachers.
- Opportunities for collaborative research exist with nearby Scripps Institute, Max-Plank Institute, and Torrey-Pines Institute.
- If approved, construction of the recently proposed Science Building on the Jupiter campus could significantly increase the department's teaching, research, and collaborations there.
- Interdisciplinary research collaborations have been established between departments within FAU (Biological Sciences, Environmental Science, Biomedical Science).
- The merger of the Harbor Branch Oceanographic Institute with FAU offers additional opportunities for research collaborations.
- The return of Professor Gregg Fields and the administration's commitment for hiring three new faculty offers the potential for significant positive change.

H. Weaknesses and Threats that Impede Program Progress

At the ***undergraduate program level***, weaknesses and threats of our program include the following:

- Increasing class sizes (some now exceeding 300) impedes student success.
- Insufficient numbers of basic laboratory equipment often lead to unpleasant lab experiences and frustration among students.
- Laboratory space for teaching and research is exhausted.
- Inadequate preparation of many freshman students impedes their success in lower division courses.
- Inconsistent DFW rates in introductory and organic chemistry courses needs attention.

At the ***graduate and research level***, weaknesses and threats to the department include the following:

- Loss of faculty due to resignations and reassignments have led to additional teaching responsibilities on other faculty, including those on tenure-tracks.
- There is little money for recruiting of high-quality graduate students.
- There have been significant problems maintaining our major research equipment, due to inadequate funding and inability to hire support personnel.
- Faculty salaries have not kept up with national norms, which are leading to more losses and failures to attract high quality new faculty.
- Graduate student stipends and benefits have not kept up with those of other chemistry graduate programs at other institutions, making recruiting increasingly difficult.

I. Resource analysis

The basic budget allocated to our department for supplies, $60,000 per year, has been reduced $40,000 over the last several years and is woefully inadequate. After payment for basic operations (e.g., telephones, photocopying, office supplies), the remaining funds barely keep the department office operating through the year. Equipment and supplies for teaching laboratories are primarily funded through laboratory fees, which are assessed to students taking these courses, generating $100,000-$150,000 per year. Although sufficient to keep these laboratories running, these funds are insufficient to fund any new initiatives or to ensure proper maintenance of basic equipment.

New equipment for undergraduate teaching labs has been purchased through technology fees assessed to students, and in addition through a fund established by the faculty from royalties for laboratory manuals written by faculty and sold through the FAU bookstore. These royalties generate in excess of $50,000 per year. It should be noted that according to Florida Law, the faculty are not required to donate these royalties, but they do so anyway.

A list of equipment that the Department holds is shown in Table 21 below. The most major instruments are housed in Room 123 of Building 55 and include a high resolution liquid chromatograph-mass spectrometer, a matrix-assisted laser desorption time of flight mass spectrometer, and 400 and 500 MHz NMR spectrometers. Based on this list, is clear that the Department has substantial instrument holdings, although some of it is old and difficult to maintain.

Aside from faculty and staff salaries, the largest budget item in the department is stipends for teaching assistants (TAs), which amounts to over $700,000 per year. We often employ TAs from other departments in addition to our own graduate students to keep up with the growing enrollments, especially in the lower division laboratories.

Overall, based on the above analysis, it is evident that the department has sufficient resources to maintain its existing programs at a minimal level, but has very little left for expansion or innovation.

Table 21: Instrumentation, Department of Chemistry and Biochemistry

Bldg-Room/PI	INSTRUMENT
43-105/Carraher	Phoenix Light Scattering Photometer
	Olympus CH30 microscope
	GenRad 1650 B Impedance Bridge
	1311-A General Radio Audio Oscillator
	General Radio 3000 Amplifier Null Detector
	RCA Picoammeter WV-511A
	Fisher Large Centrifuge
	Hewlett Packard 3455A Digital Voltmeter
	General Radio Impedance Bridge Model 1608-A
	Hewlett Packard 191 Digital Multimeter
	Hewlett Packard 6516A DC Power Supply
	Orion Research Analog pH Metter Model 301
	Thermolyne Model PM IK50 Pyrometer & Millivolt Meter
	Sargert Welch Direct Torr Vacuum Pump 8806
	Fisher Isotemp Vacuum Oven Model 281
	National Appliance Company Vacuum Oven Model 5831
	SOLA MCR Mini/Micro Computer Regulator Voltage Control
	Valhalla Scientific Multimeter-Counter Model 4440
	I^2R Thermo-O-Watch L7-1100SA1287
	Brice Phoenix 4000 Universal Light Scattering Photometer
	Bauch & Lomb Abbe Model 3-L Refractometer
	Mettler AE240 Top loading electronic balance (+/- 0.1 mg)
43-109/ Common	Jasco 4100 FTIR
	Jasco P-2000 Polarimeter
	Jasco J-810 Spectropolarimeter (Circular Dicroism)
43-125/Mari	ABI PROCISE Protein Sequencer
	Nikon Eclipse TS100 microscope w. image capture
	Axon Instruments Multi-Clamp 700B (nerve manipulator)
	Sutter Instruments P-97 Micropipette puller.
43-127/de Lill	Perkin Elmer Lambda 850 UV/Vis
	Perkin Elmer L855 Spectrofluorimeter
	Labconco Glove Box Mdl. 50004
	AceGlass 7836-20 Photochemical Cabinet
	Schlenk Lines (3 each)
	Mettler-Toledo TGA/DSC-1 $STAR^e$- System
43-130/Mari	New Brunswick U725 Ultracold Freezer
	Steri-Gard Biosafety Cabinet
	NuAire DHA JTO Flow CO_2 Incubator
	Ansco Eagle-10 Stterilizer
43-135/Mari	HPLC #1; LDC Spectromonitor 3200 & PE LC Pump 250
	HPLC#2; PE 200 Micro LCPump & PE 235C DAD

	HPLC #3; PE 250 LCPump & PE 235C DAD
	HPLC #4; PE 200 Micro LC Pump & LDC Spectromonitor 4100
	HPLC #5; PE 200 Micro LC Pump & LDC DAD 5000
	Sorvall RC2-B Refrigerated Centrifuge
	New Brunswick U725 Ultracold Freezer
	Fisher Isotemp Cold Cabinet
	IEC Centra 4B Centrifuge
	Exigent Nano-LC-1D Plus LC Pump.
43-139/Lepore	HPLC #1 Hitachi L6200Apump & L4200H Uv-Vis & AS2000 Autosampler
	HPLC #2 Hitachi L6200Apump & L4200H Uv-Vis & AS2000 Autosampler
	Rotary Evaporator(s) Buchi RE111
	Welch Vacuum Solvent Drying System
43-248/Lepore	Hewlett-Packard Mdl. 5890 Gas Chromatograph
43-249/Terentis	HPLC #1; Spectrasystems SCM1000& P4000 & UV2000
	HPLC #2; Spectrasystems SCM1000& P4000 & UV2001
43-233/Terentis	ThermoScientific Evolution 60S UV/Vis
	Olympus 1X51 Imaging Microscope w. Digital Capture
	Forma Scientific Biosafety Cabinet
	Forma Scientific HEPA filtered incubator
	HORIBA HR800 RAMAN spectrometer
55-123/Common	ABI Voyager-DE Pro
	Varian Mercury-Plus 400 MHz NMR spectrometer
	Thermo LTQ XL w. Agilent 1200 Quaternary Nano-LC pump
	Varian UNITY-INOVA 500 MHzNMR Spectrometer
55-145/common	Finnigan LCQ-DECA ESI/APCI
	Fisher Vortex mixer
	Fisher FS20H Sonicator
	Mettler AE100 Analytical Balance
55-204A/GenlChm	Vernier LabPro PC-interface 12 each (Hess's Law)
	Ocean Optic USB-4000 UV/Vis w. Dell PCs 12 each (Beer's Law)
55-206A/GenlChm	Vernier LabPro PC-interface 12 each (Hess's Law)
	Hewlett-Packard 5890 Series-II GCw. Autosampler
55-230/teaching	Horiba Xplora Raman microscope
55-233/Bio&PChm	Parr Mdl. 1241 Adiabatic Calorimeter
	Varian Cary-3 UV/Vis spectrophotometer
	BioRad PowerPac 3000 Gell Electrophoresis
	EC-458 Power pcak Gel Electrophoresis
	7 ThermoScienitific Genesys 105 UV/Vis Spectrophotometers
	HPLC #1; Shimadzu SM10A/SPD-10AV/LC10AT (smplr/detector/pump)
	HPLC #2; Shimadzu SM10A/SPD-10AV/LC10AT (smplr/detector/pump)
	Perkin-Elmer EZ-210 UV/Vis spectrophotometer
	Dionex DX-100 Ion Chromatograph
	Perkin-Elmer LS55 Fluorescence spectrometer

55-239B/Orgo	2 Thermo Evolution FTIR w. ATR
	2 Bausch & Lomb Refractometer
55-240B/Inorg &c.	Jasco V-670 UV/Vis/NIR spectrophotometer
	3 Spectronic 20D Spectrophotometers
	Nicolet Avatar FTIR
	Perkin-Emer Lambda-4 UV/Vis spectrophotometer
	Johnson-Matthey Magnetic Susceptability Balance
	Perkin-Elmer STA 6000 simultaneous thermal analyzer
55-306/Du	Perlong DNM-9602 Microplate Reader
	Eppendorf 5810R Refrigerated Centrifuge
	PS3 Peptide synthesizer Protein technologies inc.
	Thermo-Forma Class-IIA2 Biosafety Cabinet
55-308/Du	Agilent 1260 infinity HPLC System
	Horiba Fluoro-MAX-4 Spectrofoluorimeter
	VWR Cold Cabinet
55-313/West	Agilent 6120 Quadruploe LC-MS w. Series 1100 HPLC and 1260 ELSD
55/314/West	HPLC#1; Beckman Coulter System Gold-126 w. Sedex ELSD
	HPLC#2; Shimadzu w. ELSD-LTII
	ThermoSavant Solvent Evaporator
	Virtis BEnchTop Lyophilizer
	Fisher Isotemp Cold Cabinet
	NuAire Biosafety Cabinet
	Spectroline UV Lamp
55-318/West	LabConco Biosafety Cabinet
	New Brunswick INOVA-44 Shaker-Incubator
	ShelLab CO_2 series Incubator
55-355/common	Perkin Elmer Autosystem XL GC-MS
	Perkin Elmer Clarus 580 GC-FID
	Perkin Elmer UV/Vis/NIR Lambda 900
	Hitachi HPLC 7000 system
	Leco Pegasus IV GC-TOF

J. Future directions for School or College

Over the last six years, the Department has met its increasing teaching responsibilities, primarily by increasing class sizes in lower division courses. Our undergraduate B.A. and B.S. degree programs are solid and thriving. On the other hand, while our graduate programs and research funding remain very active, there are disturbing negative trends in both. Inadequate recruiting, uncompetitive stipends and the loss of faculty have led to significant reductions in graduate enrollment and external research funding. Additional resources need to be allocated to meet these increasingly threatening problems. Fortunately, a highly productive chair has been hired with a commitment for hiring three new faculty in the near future. The proposed expansion of Chemistry programs and facilities on the Jupiter campus poses both opportunities and challenges for the department. Additional sources of funding for innovative research and teaching activities will need to be identified and pursued. In any event, growth of the department's research and teaching efforts is imperative. Recruiting outstanding faculty who compliment our current research and attracting excellent graduate students is of the highest importance in continuing this growth. This can only be accomplished through well thought out strategic planning.

K. Student Feedback

Chemistry student's perception of the quality of their instruction and advising can be measured by the results of surveys taken at the end of semester (Tables 22 and 23) and upon graduation (Table 24). Overall, students rated both the quality of instruction (Table 22) and the quality of instructors (Table 23) as a little over 2 on a 5 point scale (5 being the worst) for both undergraduates and graduates, which is certainly acceptable. Ratings for the quality of faculty advising and advising in the major (Table 24) approaches 3.0, which is very good since the scale was reversed in that survey.

It should be noted that the survey data in Table 24 was generated from a small number of respondents, so its validity is questionable. Nevertheless, there has been a strong effort to improve student advising in the college and university. As of 2014, most routine advising of undergraduates is now handled by professionals in a reorganized college student services office. Now faculty are only involved in choosing elective courses (including Directed Independent Study), career advising and working with students with unusual backgrounds, such as international students. This seems to have improved overall satisfaction of students with advising, although we await new survey results.

Table 22: Student ratings for instructional quality.

Scale 1=Excellent 5=Poor			20. Rate the quality of instruction as it contributed to your learning in the course.				
			Chemistry			College Total	University Total
			2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate	# Sections		188	214	231	1,510	5,771
	Mean Rating		**2.3**	**2.4**	**2.1**	**2**	**1.9**
Graduate	# Sections		8	8	4	130	1,016
	Mean Rating		**1.8**	**1.9**	**2.2**	**1.7**	**1.7**
Total	# Sections		196	222	235	1,640	6,787
	Mean Rating		**2.3**	**2.4**	**2.1**	**2**	**1.8**

Table 23: Student ratings for quality of instructors.

Scale: 1=One of Most Effective 5=One of Least Effective			21. What is your rating of this instructor compared to other instructors you have had?				
			Chemistry			College Total	University Total
			2010-2011	2011-2012	2012-2013	2012-2013	2012-2013
Undergraduate	# Sections		188	214	231	1,510	5,771
	Mean Rating		**2.4**	**2.5**	**2.2**	**2.2**	**2**
Graduate	# Sections		8	8	4	130	1,016
	Mean Rating		**1.8**	**2.3**	**2.5**	**1.9**	**1.9**
Total	# Sections		196	222	235	1,640	6,787
	Mean Rating		**2.4**	**2.5**	**2.2**	**2.1**	**2**

Table 24: Student ratings for quality of advising (college and university rating in the last two columns).

			2006-2007	2008-2009	2010-2011	2012-2013	2012-2013	2012-2013
Student Level			28	25	13	11	356	2,211
Undergraduate	**Quality of courses in degree program**	**# Responses**						
		Mean	**3.0**	**2.9**	**2.3**	**3.3**	**3.0**	**3.0**
	Quality of instructors in degree program	**# Responses**	26	25	13	11	333	2,137
		Mean	**2.9**	**2.8**	**2.7**	**3.2**	**2.9**	**3.0**
	Quality of advising in college advising office	**# Responses**	24	21	12	7	310	1,933
		Mean	**2.5**	**2.7**	**2.5**	**3.4**	**2.8**	**2.8**
	Quality of advising by faculty	**# Responses**	23	18	12	7	257	1,808
		Mean	**2.8**	**3.0**	**3.0**	**3.1**	**2.8**	**2.9**

L. Questions for Internal and External Reviewers

(1) As our main focus is to be Chemical Biology, what courses do you recommend that we add in order to better prepare both our undergraduates but especially our graduate students for success in fields of endeavor which would fall under that heading?

(2) For graduate study in either or both the focus area of Chemical Biology or chemistry in the broadest sense, do you recommend adding any graduate level laboratory courses, such as advanced instrumental analysis or the-like?

(3) Having reviewed our Departmental instrumentation infrastructure, what are the shortcomings that you can identify?

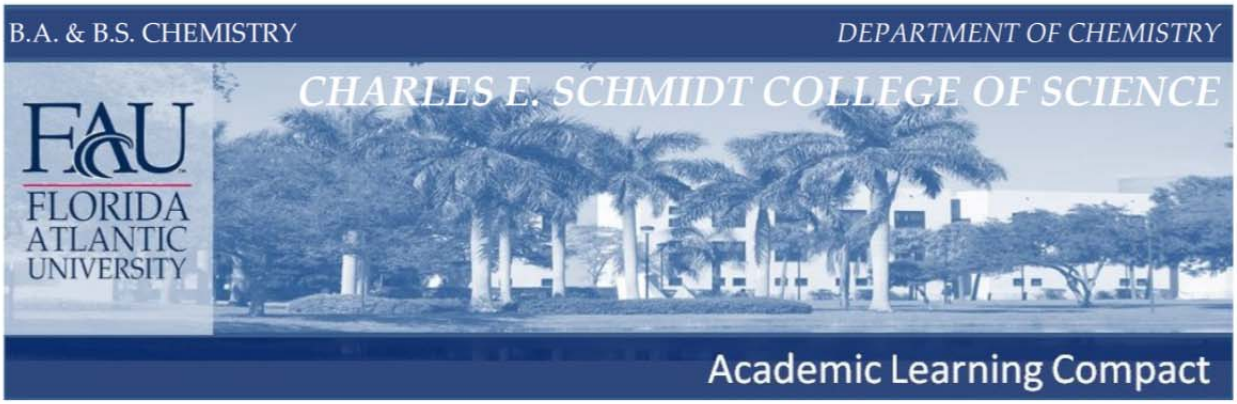
(4) Do you feel that the support staff presently in our department is adequate? If not, what changes do you recommend?

(5) Do you feel that the University should provide faculty with a certain level of expense monies for the operation of their laboratories given that undergraduate students enrolled in Directed Independent Study courses utilize these facilities? Please recall that undergraduate research experiences (viz. experiential learning) is a university -wide focus.

(6) Given that Environmental Sciences is already a strong interdisciplinary program at FAU and given that Marine and Coastal Studies is a declared area of emphasis for the University, do you recommend that our department interface with these programs? If so, what would be needed in the way of faculty and support to ensure that those activities do not detract from the main focus of Chemical Biology?

(7) Can you suggest any grant or contract avenues that we may overlooking for research and/or teaching support?

Appendix A: Academic Learning Compacts (ALCs) or Student learning Outcome Assessments (SLOAs) for the Undergraduate Programs in Chemistry and Biochemistry



CONTENT KNOWLEDGE (Declarative knowledge): Graduates in Chemistry will understand basic concepts, theories, and experimental findings in four core areas of chemistry (analytical, biochemical, inorganic and physical).

CRITICAL THINKING (Analytical Skills): Graduates in Chemistry will use critical thinking to evaluate information and data related to chemical processes by applying basic principles of scientific methodology including (1) the nature of scientific explanations, (2) threats to the validity and reliability of observations, (3) the limitations of measurement scales, (4) the use of experimental and quasi-experimental designs to test hypotheses and (5) the proper interpretation of correlational and experimental data.

Students will complete the following courses, which adhere to guidelines of the American Chemical Society's Committee on Professional Training:
CHM 3120 & CHLM 3120: Quantitative Analysis Lecture and Lab
BCH 3033 & BCHL 3103: Biochemistry 1 and Biochemistry Lab
CHM 3609 & CHML 3609: Inorganic Chemistry Lecture and Lab
CHM 3410 & CHML 3410: Physical Chemistry 1 Lecture and Lab
CHM 3400: Introduction to Physical Chemistry

Examinations, research papers, and laboratory reports in each of these courses will be used to assess students' content knowledge and understanding of scientific methodology. Students with a grade of C- or higher in each of the core courses will be deemed to have met this outcome. Students who earn grades below C- will be required to repeat the course.

CONTENT KNOWLEDGE (Technical Skills): Graduates in Chemistry will be able to perform laboratory techniques sufficient to conduct basic and advanced experiments in Chemistry and Biochemistry.

Students will complete laboratory courses (CHML 3120, BCHL 3103, CHML 3609, and CHML 3410) in which they will conduct laboratory experiments. Students will be assessed on their technical expertise, in accord with the guidelines of the American Chemical Society's Committee on Professional Training.

COMMUNICATION (Written communication): Graduates in Chemistry will be able to produce writing that is grammatically correct, well-organized, and properly formatted and in accord with the American Chemical Society's Style Guide.

COMMUNICATION (Graphic Communication): Graduates in Chemistry will be able to produce and interpret charts, graphs and tables that effectively and accurately display chemical data, relationships and principles.

Students will complete laboratory courses (CHML 3120, BCHL 3103, CHML 3609, and CHML 3410) in which they will complete laboratory reports that require written and graphical components as appropriate to the assignment. These reports will be assessed for knowledge and application of the guidelines of the American Chemical Society's Style Guide and for skills in conveying knowledge of chemistry in written and graphical forms. In addition, students will be required to take and pass one course designated in the university's Writing Across the Curriculum program to demonstrate general writing skills. Students must earn a grade of C- or higher in that course, as well as in all of the above courses that are required in their degree program. Students who earn grades below C- will be required to repeat that course.

Appendix B: Assessment Data Table

TABLE: Standardized exam scores and/or percentiles for various chemistry courses in the Department of Chemistry and Biochemistry

semester ⇨	**SP11**	**SU11**	**FA11**	**SP12**	**SU12**	**FA12**	**SP13**	**SU13**	**FA13**	**SP14**
Organic Chemistry I	-	-	2006 acs: 34.4% (std 13.1)	acs hybrid: 51.24 %	2006 acs: 39.8% (std 10.0)	acs hybrid: 54.26 %	acs hybrid: 51.35 %	acs hybrid: 59.66 %	skills test: 40.59 % acs: 43.77 %/65th percentile	skills test: 43.95 % acs: 50.54 %/83rd percentile
Organic Chemistry II Lab	skills: 68.97 % OLEAT: 60.40 %	skills: 71.30 % OLEAT: 65.66 %	skills: 68.09 % OLEAT: 46.38 %	skills: 72.26 % OLEAT: 51.07 %	skills: 65.83 % OLEAT: 63.82%	skills: 61.50 % OLEAT: 51.72 %	skills: 62.84 OLEAT: 55.99 %	skills: 64.60 % OLEAT: 58.26 %	skills: 55.35 % OLEAT: 48.20 %	skills: 52.22 % OLEAT: 35.76 %
Quantitative Analysis	-	-	35.59/83th percentile	-	-	30.19/80th percentile	-	-	22.22/ unknown percentile	
Inorganic Chemistry	23.71/22ND percentile	-	-	24.32/31^{sth22} percentile	-	27.86/35th percentile	27.2/32nd percentile	-	25.4/25th percentile	31.3/47th percentile
Physical Chemistry II	acs only: 67% (std 9.5) 83rd percentile	-	-	acs only: 53.83% (std 10) 52nd percentile	-	-	acs only: 50.3% (std 12.3) 42nd percentile	-	-	acs: 50.10% (std 6.0) 42nd percentile duck: 49.85% (std 5.9)

Key: “acs” = standardized test from American Chemical Society; “acs-hybrid” = a combination of acs exam questions plus acs-style exam questions from the instructor; “-“ = not available or not administered; “percentile” = national rankings compared to students from other schools; “skills-test” = a pre-test administered in organic chemistry classes based on general chemistry I concepts that are relevant for organic chemistry; “std” = standard deviation (when available); “OLEAT” = organic laboratory experimental assessment tool, this practical test is taken by students at the end of each semester to evaluate their hands-on laboratory and critical thinking skills; “skills” = a test that (called “spectroscopy workshop”) we give to all incoming organic lab students to test their knowledge and ability to calculate theoretical yields and carry out basic spectral interpretations, all skills and concepts tested are from in organic I lecture and general chemistry I and II lab courses; “duck” = ACS Exam Institutes Diagnostic of Chemistry Knowledge Exam, and is given to our students in their final course (Phys Chem II), we commenced this in Spring 2014.

Appendix C: An excerpt from the ACS CPT guidelines document for undergraduate chemistry degrees pages 6-14, per pdf from ACS website:

www.acs.org_content_dam_acsorg_about_governance_committees_training_acsapproved_degreeprogram_2003-acs-guidelines-for-bachelors-degree-programs

1.3 Curriculum Requirements

Introduction. The principal purpose of the ACS approval process for undergraduate programs is to help departments provide chemistry majors with a sound education in the fundamental areas of modern chemistry. The CPT believes that it can help departments best by setting general curricular goals rather than by specifying exact curricular structure, realizing that a department's curriculum should build on the strengths of the institution and its faculty. Programs as different in character as those with a major emphasis on fundamental principles and those that are strongly based on industrial applications have produced students who have gone on to have distinguished careers in chemistry. As stated in the Introduction, the Committee encourages departments to explore the many ways in which a curriculum can meet the guidelines described below.

Core Curriculum Requirements. Programs of study in chemistry curricula for majors and nonmajors can be organized in many ways to reflect the institution's mission, the available facilities, and the interests and capabilities of the students and faculty. Regardless of which organization of the curriculum is adopted, that part of the program specified as the core curriculum is taken by all certifiable chemistry graduates and includes a minimum of 28 semester credit hours (or the equivalent for institutions on the quarter system) of basic instruction with comparable emphasis on the areas of **analytical chemistry, inorganic chemistry, organic chemistry, and calculus-based physical chemistry**. At least three semester credit hours of **biochemistry** must also be part of the undergraduate curriculum for all certified graduates. There are at least three possible modes for satisfying the biochemistry requirement. One consists of integrating the equivalent of three semester credit hours of biochemistry into the core by distributing the material among other core courses. The second is to offer biochemistry as a separate core course. The third is to require biochemistry as one of the advanced courses. For degree options other than chemistry itself, some of the core may be modified as indicated in the Degree Options section below.

The 28 semester credit hours of study shall include a minimum of 7 semester credit hours (300–350 contact hours) of laboratory instruction distributed, not necessarily in equal proportions, among synthesis and characterization of inorganic and organic compounds, chemical and instrumental methods of analysis, and experimental physical chemistry. Although a laboratory component is not required for biochemistry, such experience is welcome.

All of the core should be taught annually. Under special circumstances, some core courses may be taught on a regular biennial schedule that enables all students to take them in a planned way.

Advanced Course Requirements. Advanced courses build in a significant way upon concepts introduced in the core curriculum (see Commentary on Advanced Courses in Sec. 1.4). A minimum of two advanced courses must be taught on a regular cycle. In addition to the core curriculum, minimum requirements for approval of the chemistry degree program and for certifying students as having completed this program follow.

Chemistry. Six semester hours of advanced courses that include sufficient laboratory work to bring the total number of laboratory contact hours to 500. For individual students, the advanced courses may include or even consist entirely of research that culminates in a comprehensive written report. If the equivalent of three semester credit hours of biochemistry is not incorporated into the core, one of the advanced courses must be a course in biochemistry.

Degree Options. In addition to the required chemistry degree program, approved departments may offer up to six degree options. Minimum requirements for the following five degree options are completion of the core curriculum, the equivalent of three semester credit hours of biochemistry, a total of 500 laboratory contact hours, and advanced course work as described below. Advanced courses may be offered by departments other than chemistry.

Biochemistry. Beyond the introductory level, three semester hours of biology, which contains cell biology, microbiology, or genetics; six semester hours of biochemistry that has organic chemistry as a prerequisite; and one semester of a laboratory in biochemical methods. Research in biochemistry culminating in a comprehensive written report is highly recommended.

Chemical Physics. Six semester hours of physics beyond the first-year level and at least six semester hours selected from advanced theoretical chemistry, advanced physics, or advanced mathematics. These advanced courses may include physics

laboratory and/or research culminating in a comprehensive written report.

Environmental Chemistry. Six semester hours of biology, geology, or other environmentally related science, and at least six semester hours of advanced work in chemistry of the environment, including some aspects of aquatic chemistry, atmospheric chemistry, and geochemistry. Field work and studies of modeling in environmental systems are encouraged in the advanced work. These advanced courses may include research culminating in a comprehensive written report.

Materials. Equivalent of six semester hours of materials science, including polymer ceramics, metallurgy, and solid-state devices; one semester of materials science laboratory, including synthetic and physicochemical characterization of processed materials; and at least three semester hours of an advanced course, which may be research culminating in a comprehensive written report.

Polymers. Equivalent of six semester hours of polymer science, including an introduction to materials science and the organic, inorganic, and physical chemistry of polymers; one semester of polymer science laboratory; and at least three semester hours of an advanced course, which may be research culminating in a comprehensive written report.

Departments have the flexibility in association with the above degree options of reducing the core by up to four semester hours. The expectation for the core remains that it includes balanced emphasis on the areas of analytical, inorganic, organic, and physical chemistry. The reduction in the core should not entirely eliminate any of these areas.

The sixth degree option that an approved department may apply to offer is chemistry education, which is designed for students who are also completing education courses for a pre-college teaching career.

Chemistry Education. The core, laboratory, and advanced course requirements are different for the chemistry education degree option. Minimum requirements for this degree option are a total of 33 semester credit hours of core and/or advanced chemistry courses, which include no fewer than 270 total laboratory contact hours. Students take the same first two years that certified chemistry majors take in introductory and organic chemistry, but only one semester of organic chemistry laboratory is required. Experiences equivalent to one-semester courses in biochemistry, analytical or environmental, inorganic, and physical chemistry are required, along with one additional course or research that builds on this foundation. In addition, the equivalent of a three-semester-credit-hour course in chemistry teaching methods is required (see Commentary on Chemistry Education in Sec. 1.4). Students are also expected to complete the courses in education needed for teacher certification as defined by state requirements.

Chemistry faculty are expected to be directly involved in the design and instruction of the chemistry teaching methods course.

Approval of degree options requires that the chemistry program itself be approved. Degree options may involve departments other than chemistry, but appropriate materials must be submitted for approval with the cooperation of the previously approved chemistry program, which provides the core.

Graduates may only be certified in degree options if those options have been approved by ACS. Individual graduates may be certified in more than one degree option *but are counted as certified only once by ACS.*

Ancillary Course Requirements. Calculus is required for physical chemistry. Certified graduates should study calculus through multivariate analysis and be exposed to linear algebra and differential equations. Work equivalent to at least a one-year, laboratory-based course in physics, preferably at a level involving calculus, is required and should precede the basic course in physical chemistry and most advanced work in chemistry.

Minors in Chemistry. A minor in chemistry should include a minimum of 20 semester credit hours (or equivalent). Two or more areas of chemistry should be chosen beyond the first-year courses in chemistry from the following: analytical, biochemistry, environmental, inorganic, organic, and physical. A minor should include 200 total contact hours of laboratory experiences in at least two different areas beyond firstyear chemistry. The award of a minor in chemistry to a graduate does not lead to certification of the student.

Although the Committee provides advice for a minor in chemistry, the only minor evaluated by the CPT is the minor in chemistry education described below. Graduates may only be awarded an ACS minor in chemistry education if the minor has been approved by ACS.

Minor in Chemistry Education. In addition to the above description of a chemistry minor, one semester of physics with laboratory and the equivalent of a threesemester-credit-hour course in chemistry teaching methods. Students who receive an ACS minor in chemistry education are also expected to complete a major in

another natural science.

1.4 Commentary on Curriculum Requirements

The Core Courses in Chemistry. The Committee recognizes that numerous course structures and sequences exist, particularly with regard to integration of core topics throughout the curriculum. Many institutions choose to retain a traditional firstyear course, which includes general principles of chemistry, descriptive chemistry of the elements, introductory principles of physical chemistry, and chemical analysis. In other cases, a student's introduction to college chemistry may be through courses that are more specific in coverage of organic chemistry, inorganic chemistry, or quantitative chemical analysis. In any case, portions of the first-year course may be used to satisfy some of the core requirements. For the Committee to assess the contribution of firstyear course work to overall coverage of core topics in the curriculum, supporting documentation in the form of syllabi and examinations is required.

The guidelines provide considerable flexibility in satisfying the curriculum that is required for approval. For example, if basic inorganic chemistry and chemical analysis along with organic chemistry are covered in the first two years, the remaining core material is covered typically with additional study of physical chemistry, inorganic chemistry, and instrumental methods of analysis. Frequently, the study of inorganic chemistry and instrumental analysis requires organic chemistry and calculus-based physical chemistry as prerequisites. If biochemistry is part of the core, it could be distributed in the analytical chemistry, inorganic chemistry, organic chemistry, and physical chemistry sequences.

Having a degree option without excessive requirements may depend on creative reworking of the core. Integrated laboratories are one accepted way to make a curriculum more efficient. Wherever possible, core courses should include examples of materials chemistry, polymer chemistry, and applied chemistry, particularly in cases where these areas are not covered in advanced courses. Throughout the core, attention should be given to teaching the principles of chemical safety and to the systematic use of chemical information.

The First-Year Courses in Chemistry. A first-year course in chemistry poses a challenge for many departments. A course designed for students who already have an adequate background in chemistry can include partial coverage of some of the core topics discussed above. A course designed for science-oriented students lacking this background, however, may be more general in character. Chemistry departments must also recognize their special obligation to serve the educational needs of students not oriented to science, an obligation that is a major challenge to the profession and an excellent opportunity to make a significant contribution to the careers and intellectual development of many future citizens and community leaders. The Committee welcomes innovative approaches to meeting these challenges. At the same time, however, the Committee is attentive to determining whether a particular first-year course is playing its intended role as part of the core curriculum. For this reason, the Committee asks the department to provide information regarding the distribution of core topics throughout the curriculum, particularly the manner in which they are included in first-year courses.

A first-year course and the subsequent courses in chemistry should incorporate historical perspective as well as references to current developments in chemistry. Emphasis on pure theory has too often led to neglect of the practical, aesthetic, and humanistic aspects of chemistry. Classroom experiments and demonstrations are particularly effective in presenting descriptive material and in generating lasting interest in chemical phenomena, and they should be employed wherever possible. Discussions of real-world problems and an early introduction to instrumental and computational techniques can give students an immediate sense of how chemistry is done today. Such teaching can also be an effective way to capture student interest. Similarly, efforts should be made to use various forms of multimedia learning resources such as computers, slide and videotape presentations, hands-on classroom activities, and Internetbased instructional materials.

Laboratory Work in Chemistry. Laboratory instruction should include practical experience with instrumentation for spectroscopy, chemical separations, and electrochemical methods. It should give students hands-on experience with chemistry and the self-confidence and competence to

- keep legible and complete experimental records;
- synthesize and characterize inorganic and organic compounds;
- perform accurate and precise quantitative measurements;
- use and understand modern instruments, particularly NMR, FT-IR, and UV-vis spectrometers; GC, GC-MS, and HPLC instruments for chemical separations; and electrochemical instruments;
- interpret experimental results and draw reasonable conclusions;

• analyze data statistically and assess reliability of results;
• anticipate, recognize, and respond properly to hazards of chemical manipulations;
• design experiments;
• plan and execute experiments based on searching and using the literature;
• communicate effectively through oral and written reports; and
• work effectively in small groups and teams.

A number of schools have combined the experimental techniques from such specialties as physical chemistry, chemical analysis, and synthetic organic and inorganic chemistry into integrated laboratory experiments or into problem-based laboratory experiences. In such cases, care should be taken to ensure that the number and types of experiments are at least equivalent to those of more traditional laboratory curricula and that the integration of laboratory work does not result in the loss of important concepts stressed in a particular chemical specialty. To assess the coverage in integrated laboratories, the Committee asks to see syllabi and experiment lists.

While computer simulation can enhance instruction in laboratory instrumentation, computer-simulated instruments cannot substitute for actual instruments and real samples. On the other hand, chemical computation of the properties of molecular and macromolecular systems has become a familiar and important part of chemical laboratories, and such experiences may count toward the laboratory requirement for certified majors.

Biochemistry. Biochemistry must be part of the curriculum for all certified majors. Approved programs may implement this requirement by integrating the equivalent of three semester credit hours into required core courses, offering a separate required core course in biochemistry, or requiring certified graduates to take an advanced course in biochemistry. A laboratory experience in biochemistry is optional.

If a department adopts the advanced course approach, the minimum number of semester credit hours of basic instruction in the core would continue to be 28. If biochemistry is integrated into the core, the remaining part of the core must have a comparable emphasis on analytical, inorganic, organic, and physical chemistry. When biochemistry is integrated into the core, the CPT expects syllabi and exams to be supplied as part of five-year reports. If the biochemistry course is used as an advanced course and is not taught in the chemistry department, it must meet the standards for advanced courses described below.

Advanced Courses. For the purpose of approval of departmental programs and certification of graduates, advanced chemistry courses are defined as those that (a) are not part of the core (some of which might carry the department's description as "advanced") and (b) have a major portion of the core curriculum as a prerequisite, including physical chemistry in many but not necessarily all cases. Advanced courses must build in a significant way upon concepts introduced in the core curriculum. For example, a biochemistry course that uses quantitative concepts involving kinetics, thermodynamics, and solution properties of macromolecules and has two semesters of organic chemistry as a prerequisite would be acceptable. Similarly, a synthesis course that builds on elementary courses and offers truly advanced material is acceptable without a physical chemistry prerequisite. Assessment tools for advanced courses should verify that the course material builds significantly upon the core curriculum. For those advanced courses for which physical chemistry is not a stated prerequisite, the Committee requests copies of the course syllabi, all examinations, and other assessment tools.

At least two advanced courses must be taught on a regular schedule that permits students to enroll in the courses in proper sequence and with reasonable flexibility. Although an individual student may be certified by the substitution of six semester hours or the equivalent in research for two advanced courses, the department is expected to teach advanced courses for two reasons. One reason is to provide an alternative path for certification for students who do not do sufficient research. The other reason is to engage faculty members in the professional enrichment that comes from teaching advanced courses.

Research. Undergraduate research can integrate the components of the core curriculum into a unified picture and help undergraduates acquire a spirit of inquiry, independence, sound judgment, and persistence. By doing research, undergraduates develop the ability to use the chemical literature and report effectively in spoken and written presentations. Also, supervision of research helps the faculty maintain enthusiasm, professional competence, and scholarly productivity.

The Committee strongly endorses undergraduate research as one of the potentially most rewarding aspects of the undergraduate experience. A successful project requires proper and careful attention by the faculty advisor. It places heavy demands on the faculty, the students, and the institution. The ideal research project is well-defined, stands a reasonable chance of completion in the time available, avoids excessively

repetitive work, requires the student to use advanced concepts as well as a variety of experimental techniques and instruments, and develops chemical information that might be publishable. It brings the student into active contact with the research literature. Though reality frequently falls short of the ideal set of goals, the experience can nevertheless be extremely valuable.

A well-written, comprehensive, and well-documented research report must be prepared, regardless of the degree of success of a student's project. The faculty supervisor should constructively criticize the report during the draft stage. Oral, poster, and computer presentations do not meet the requirement of a comprehensive written report. Student co-authorship on a journal article, while highly desirable, is not a substitute for a comprehensive report written by the student.

As much as two semester equivalents (six semester hours) of research consistent with this description may take the place of advanced courses for certification of individual students. A good research project would involve at least 90 hours of work per semester (or the equivalent in quarter hours) and could provide the additional hours to bring the laboratory total to 500 hours. If research is used as one or both advanced courses for certification of students, the Committee asks to see examples of graded student research reports as part of each five-year review.

Research done off campus must meet the same high standards as on-site research. In addition, a faculty member at the home institution must take responsibility for the quality of the research done off-site and for the quality of the final report on the research. Such comprehensive reports on the research done off-site should be evaluated by the sponsor at the home institution and made available for submission to the CPT as part of a five-year report.

Many institutions have substantial summer undergraduate research programs. Student participation in some of these research programs may even be required. Research done during the summer, even though it may not be credit-bearing, may count toward certification of individual students (*e.g.*, in place of senior research). For summer research experiences to be counted in this way, the work should be of at least eight weeks in duration, and the standards of final report writing should be as high as those expected during the academic year. Such final reports must be evaluated by a faculty member at the home institution and must be available for submission to the CPT as part of a five-year report.

Chemistry Education Option and Minor. There is a critical need for high school chemistry teachers, who will have a substantial impact on undergraduate and graduate chemical education, as well as on the profession. Many well-trained high school chemistry teachers are close to retirement, and most teachers of high school chemistry courses have limited college-level work in chemistry. The CPT has developed two programs for addressing the need to prepare students for a high school teaching career: a streamlined chemistry education option and a new minor in chemistry education. Both of these can be offered by ACS-approved chemistry programs after applying to the CPT and receiving approval.

The chemistry education option degree is designed for students preparing for a pre-college teaching career in chemistry. The total number of chemistry courses and laboratory contact hours has been reduced for this option degree to provide the requisite time in an undergraduate curriculum for students to complete course work in education needed for state certification to teach in secondary schools. The Committee recognizes the importance of laboratory work for pre-service teachers as preparation for their future chemistry teaching through inquiry-based exercises and therefore strongly encourages laboratory experience beyond the minimum requirement through course work or research. The chemistry teaching methods requirement for this option and the minor in chemistry education ensures that students develop the skills needed for teaching secondary school chemistry. This requirement may by satisfied by completion of a specific course or by other experiences that include laboratory experiment design and preparation, acquisition and storage of chemicals and laboratory apparatus, safety, disposal of chemical waste, teaching assistant experience, and the literature of chemical education. This requirement may be met through various means, including independent study, teaching assistantships, a specific methods course, and interdisciplinary study. Chemistry faculty are expected to be directly involved in the design and instruction of the chemistry teaching methods course.

The minor in chemistry education is designed for students preparing for a pre-college teaching career in a natural science other than chemistry. High school science teachers are often called upon to teach many science disciplines. The minor in chemistry education would enable a student who is majoring in a different natural science to obtain some chemistry knowledge and practical skills used in teaching high school chemistry.

Related Studies. Well-prepared students should emerge from a program in chemistry with

• a firm foundation in the fundamentals and applications of calculus, including proficiency with partial derivatives and some knowledge of differential equations;
• an understanding of the basic principles of linear algebra;
• practical knowledge of statistics with applications to validation of data and design of experiments;
• experience with computers, including an ability to use word processors, spreadsheets, numerical and nonnumerical algorithms, simulations and computation, data acquisition, and databases for information handling and retrieval; and
• a good foundation in physics.

Chemistry pervades our modern social and economic life. All chemists, including those whose interests focus strongly on research, can benefit from an understanding of economics, marketing, business, and the environment. Courses in these subjects are recommended to the extent permitted by other academic requirements. Within chemistry courses themselves, advantage should be taken at all levels of course sophistication to point out the connections between science and society.

Foreign Language. If American students are to participate fully in chemistry today, which is worldwide in scope, they should know at least one other language and culture, even though English is the international language of science. The study of a foreign language, although not required, is highly recommended, particularly for students who plan to pursue graduate studies in chemistry.

Communication and Teamwork Skills. Effective written and oral communication skills and interpersonal skills are no less essential to the well-trained scientist than to the humanist. Speech and English composition courses alone are rarely enough to give students sufficient communication skills. Frequent exercises in writing and speaking should be a part of the chemistry curriculum and should be critically evaluated by the chemistry faculty. Ideally, every course should be an exercise in expressing ideas clearly. Seminars, progress reports, term papers, laboratory reports, problem sets, and examinations should be evaluated for clarity as well as accuracy. Tutoring and assisting in the laboratory also are highly effective ways for students to consolidate their chemical knowledge and improve their communication skills.

The ability to work in multidisciplinary teams is essential for a well-educated scientist today. Programs should incorporate teamwork experiences in classroom and laboratory components of the chemistry curriculum.

Curricular Innovation and Pedagogical Approaches. The Committee considers the guidelines to be consistent with using a wide range of pedagogies. Research in teaching and learning is generating an increasingly detailed picture of how students learn in their courses. Chemistry faculty are using this knowledge to improve student learning by, for example, having students build from their past experiences, using laboratory experiences to drive course instruction, organizing course content around topics of particular relevance to students, having students work in groups to build knowledge, and having students communicate their learning and results to others. The Committee encourages innovative pedagogical efforts and curriculum development.

Chemical Literature and Information Retrieval. Students preparing for professional work in chemistry must learn how to retrieve specific information from the enormous and rapidly expanding chemical literature. The complexity of this task is such that one can no longer easily acquire the necessary skills without some formal instruction. An excellent means for doing so is with a specific course, which usually would not qualify for the advanced course requirement. Other means for imparting these skills involve coordinated instruction integrated into individual courses. Library and computer exercises should be included in such instruction. In departments requiring undergraduate research, instruction in information organization and retrieval may be a part of the introduction to research. It should be recognized that adequate presentation of the subject, including an understanding of the use of *Chemical Abstracts*, *Science Citation Index*, *Current Contents*, *PubMed*, and other compilations, will generally require formal instruction. It is essential that students gain experience with online, interactive database searching, which can include some of the compendia mentioned above.

Professional Ethics. Chemistry is a discipline in which high standards of conduct must be exemplified by teachers and researchers in ways that students cannot fail to observe and adopt. Openness about discoveries and independent verifiability of experiments reinforce good ethical practice in the field. Disclosures of unethical practices by some scientists have caused many chemists to conclude that presenting ethical principles should be an intentional part of teaching chemistry. The Committee recommends that such instruction be part of the chemistry curriculum.

Safety. Discussions of current health and safety issues must be an integral and important part of the chemistry curriculum. Students should develop a high degree of safety awareness, beginning early in the core courses with discussions of the potential

hazards associated with chemicals and laboratory equipment. Recognized safety practices should be stressed both in classroom and laboratory discussions, including, but not limited to, compliance with the regulations of OSHA (Occupational Safety and Health Administration), the recommendations in the ACS manual *Safety in Academic Chemistry Laboratories* and in the NAS-NRC *Prudent Practices in the Laboratory: Handling and Disposal of Chemicals*, and applicable government regulations. Students should have access to Material Safety Data Sheets and be knowledgeable about the physical, chemical, and biological properties of the substances they handle. They should recognize potential hazards, minimize their risk and exposure to hazardous materials, and be prepared for the worst possible situations.

Cooperative Education and Industrial Chemistry. A distinctive feature of cooperative education is the placement of students in industry and government laboratories. Co-op programs can provide students with

- an appreciation of technology;
- broader exposure to team research, interdisciplinary research, and societal problems;
- a synthesis of pure and applied chemistry;
- opportunities to use sophisticated instruments;
- early professional experience, contacts, and information for career planning; and
- additional practice in preparing oral and written reports and in meeting deadlines.

The Committee strongly endorses cooperation between the chemical industry or government laboratories and academic institutions in educational projects. In some cases, part or all of the advanced course requirement might be satisfied through cooperative research carried out in an industrial or government laboratory and culminating in a comprehensive written report. Such cases will, however, be considered on an individual basis to ensure that the experience truly fulfills the advanced course requirement and includes the necessary faculty supervision.

Self-Instruction Programs. Self-instruction and distance-learning programs are available to help students reach one of the principal goals of professional education that is vital to the avoidance of obsolescence, namely, the ability to learn without the help of an on-campus teacher. The Committee recommends that departments explore, perhaps in cooperation with ACS local sections, self-instruction materials as supplements to traditional classroom instruction. For example, audio, video, and computer courses are available on such topics as catalysts, engineering, industrial chemistry, polymers, surfaces, signal analysis, and use of the chemical literature. Laboratory experience is, however, an essential part of learning chemistry. Such work requires hands-on experience that cannot be supplied with videotape or over computer networks. Video courses are not by themselves an appropriate substitute for advanced courses.

Supplements to the Guidelines. Supplements to the guidelines are available for many of the areas discussed in this section. Included are

- lists of topics for core courses and laboratories,
- information about degree options,
- advice on writing comprehensive research reports,
- journal subscription requirements,
- chemical information retrieval guidelines,
- laboratory safety and safety education,
- guidelines for undergraduate research, and
- teaching of professional ethics.

The supplements are reviewed and updated regularly to ensure that they reflect the current state of chemistry. The supplements are available at the CPT website and on request from the Office of Professional Training.

Appendix D: M.S. and Ph.D. Information Brochures

Graduate Programs

Charles E. Schmidt College of Science

Degree: Master of Science (M.S.)
Major: Chemistry

Research Areas : Tumor Invasion Mechanisms, Metalloenzymes, Natural Products Isolation, Natural Product Total Synthesis, Laser Raman Spectroscopy.

Important information about applying to Graduate School:

- ✓ **Transcripts:** Submit official transcripts in sealed envelopes from all schools attended. NOTE: If you attended one of the Florida State University System institutions, transcripts may be requested electronically.
- ✓ **Supporting documentation:** Supplemental applications, letters of recommendation, and/or portfolios should be submitted directly to your graduate program.
- ✓ **Conduct:** A "yes" answer to either of the conduct questions on the online application will require a written explanation. Additional information may be requested when your application is under review. Applications will not be fully processed until all conduct issues are cleared.
- ✓ **Application status:** Once your application has been submitted, you can check your application status online to ensure transcripts and test scores have been received. NOTE: Application status will say incomplete until an admission decision has been made.
- ✓ **Residency classification:** Your residency classification automatically defaults to non-Florida. After you are admitted, the residency officer will review your application and request additional documents by email if needed.

Contact/ Information

Dr. Andrew C. Terentis
Charles E. Schmidt College of Science
Department of Chemistry and Biochemistry
Building 43, Room 246
Boca Raton Campus Interactive Map

(T) 561.297.0347
(E) terentis@fau.edu
(W) http://www.science.fau.edu/chemistry/

Application Deadlines

Domestic Students
Fall(Preferred): April 15
Spring: November 1
No summer semester acceptance

International Students
Fall(Preferred): February 15
Spring: April 15
No summer semester acceptance

Admission Requirements

Domestic Students

- Undergraduate GPA of 3.0 or GRE test score of 150 (verbal) and 152 (quantitative)
- BS or BA in Chemistry or related field
- Two letters of recommendation
- Statement of personal objectives in essay form
- Resume

International Students

- Undergraduate GPA of 3.0 or GRE test score of 150 (verbal) and 152 (quantitative)
- BS or BA in Chemistry or related field
- Students are required to provide a general evaluation of their transcripts
- TOEFL score of 550 or 79-80 (IBT)
- Two letters of recommendation
- Statement of personal objectives in essay form
- Resume

Graduate Programs

Charles E. Schmidt College of Science

Degree: Doctor of Philosophy (Ph.D.)
Major: Chemistry

Research Areas : Tumor Invasion Mechanisms, Metalloenzymes, Natural Products Isolation, Natural Product Total Synthesis, Laser Raman Spectroscopy.

Important information about applying to Graduate School:

- ✓ **Transcripts:** Submit official transcripts in sealed envelopes from all schools attended. NOTE: If you attended one of the Florida State University System institutions, transcripts may be requested electronically.
- ✓ **Supporting documentation:** Supplemental applications, letters of recommendation, and/or portfolios should be submitted directly to your graduate program.
- ✓ **Conduct:** A "yes" answer to either of the conduct questions on the online application will require a written explanation. Additional information may be requested when your application is under review. Applications will not be fully processed until all conduct issues are cleared.
- ✓ **Application status:** Once your application has been submitted, you can check your application status online to ensure transcripts and test scores have been received. NOTE: Application status will say incomplete until an admission decision has been made.
- ✓ **Residency classification:** Your residency classification automatically defaults to non-Florida. After you are admitted, the residency officer will review your application and request additional documents by email if needed.

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Application Deadlines

Domestic Students
Fall(Preferred): April 15
Spring: November 1
No summer semester acceptance

International Students
Fall(Preferred): February 15
Spring: April 15
No summer semester acceptance

Admission Requirements

Domestic Students

- BS or BA in Chemistry or related field
- Undergraduate GPA of 3.0 and Graduate GPA of 3.0 (if applicable)
- GRE test score of 150 (verbal) and 152 (quantitative)
- Two letters of recommendation
- Statement of personal objectives in essay form
- Resume

International Students

- BS or BA in Chemistry or related field
- Undergraduate GPA of 3.0 and Graduate GPA of 3.0 (if applicable)
- GRE test score of 150 (verbal) and 152 (quantitative)
- Two letters of recommendation
- Students are required to provide a general evaluation of their transcripts
- TOEFL score of 550 or 79-80 (IBT)
- Statement of personal objectives in essay form
- Resume

Appendix E: Abbreviated Faculty CVs

Chair: Dr. Gregg Fields
Associate Chair: Dr. Jerome Haky
Faculty: (alphabetical order)
Mr. Patrick Ande
Dr. Charles Carraher
Dr. Donna Chamely-Wiik
Dr. Mare Cudic
Dr. Daniel de Lill
Dr. Deguo Du
Dr. Alberto Haces
Dr. Daniel Huchital
Dr. Salvatore Lepore
Dr. J. William Louda
Dr. Frank Mari
Dr. Evonne Rezler
Dr. Stephane Roche
Dr. Tito Sempertegui
Dr. Patricia A. Snyder
Dr. Andrew Terentis
Dr. Lyndon West

ABBREVIATED FACULTY CV
GREGG B. FIELDS

A. Professional Preparation

1979-1982: B.S., Department of Chemistry, University of Florida, Gainesville, FL 32611.
1983-1988: Ph.D., Department of Chemistry, Florida State University (FSU), Tallahassee, FL 32306.
1988-1991: Postdoctoral Scholar with Professor Ken A. Dill, Department of Pharmaceutical Chemistry, University of California, San Francisco, CA 94143.

B. Appointments

1991-1995: Assistant Professor, Department of Laboratory Medicine and Pathology, University of Minnesota, Minneapolis, MN 55455.
1995-1997: Associate Professor, Department of Laboratory Medicine and Pathology, University of Minnesota.
1997-2008: Professor, Department of Chemistry and Biochemistry, Florida Atlantic University (FAU), Boca Raton, FL 33431-0991.
2008-2010: Professor, Department of Biochemistry, University of Texas Health Science Center at San Antonio (UTHSCSA), San Antonio, TX 78229-3900.
2010-2014: Full Member, Torrey Pines Institute for Molecular Studies (TPIMS), Port St. Lucie, FL 34987.
2014-present: Professor and Chair, Department of Chemistry and Biochemistry, FAU, Jupiter, FL 33458.

C. Selected Peer-Reviewed Publications (most recent 5 from the last 7 years)

1. Lillian Onwuhu-Ekpete, Lisa Track, Anna Knapinska, Lyndsay Smith, Gaurav Kaushik, Travis LaVoi, Marc Giulianotti, Richard Houghten, Gregg B. Fields, and Dmitriy Minond. Novel Pyrrolidine Diketopiperazines Selectively Inhibit Melanoma Cells Via Induction of Late Apoptosis. *J. Med. Chem.* **57**, 1599-1608 (2014).
2. Michal Tokmina-Roszyk, Dorota Tokmina-Roszyk, Manishabrata Bhowmick, and Gregg B. Fields. Development of a FRET assay for monitoring bacterial collagenase triple-helical peptidase activity. *Anal. Biochem*. **453**, 61-69 (2014).
3. Lisandra E. de Castro Brás, Courtney A. Cates, Kristine Y. DeLeon-Pennell, Yonggang Ma, Rugmani Padmanabhan Iyer, Ganesh V. Halade, Andriy Yabluchanskiy, Gregg B. Fields, Susan T. Weintraub, and Merry L. Lindsey. Citrate Synthase is a Novel *In Vivo* Matrix Metalloproteinase-9 Substrate that Regulates Mitochondrial Function in the Post-Myocardial Infarction Left Ventricle. *Antioxidants Redox Signaling* **21**, 1974-1985 (2014).
4. Xuan Zhang, Jamee Bresee, Gregg B. Fields, and W. Barry Edwards. Near infrared triple-helical peptide with quenched fluorophores for optical imaging of MMP-2 and MMP-9 proteolytic activity *in vivo*. *Bioorg. Med. Chem. Lett.* **24**, 3786-90 (2014).
5. Maciej J. Stawikowski, Beatrix Aukszi, Roma Stawikowska, Mare Cudic, and Gregg B. Fields. Glycosylation modulates melanoma cell $\alpha 2\beta 1$ and $\alpha 3\beta 1$ integrin interactions with type IV collagen. *J. Biol. Chem.* **289**, 21591-21604 (2014).

D. Selected Other Publications or Products (most recent 5 from the last 7 years)

1. Gregg B. Fields. Interstitial Collagen Catabolism. *J. Biol. Chem*. **288**, 8785-8793 (2013).
2. Linda Cerofolini, Gregg B. Fields, Marco Fragai, Carlos F.G.C. Geraldes, Claudio Luchinat, Giacomo Parigi, Enrico Ravera, Dmitri I. Svergun, and João M.C. Teixeira. Examination of matrix metalloproteinase-1 (MMP-1) in solution: A preference for the pre-collagenolysis state. *J. Biol. Chem.* **288**, 30659-30671 (2013).
3. Janelle L. Lauer, Manishabrata Bhowmick, Dorota Tokmina-Roszyk, Yan Lin, Steven R. Van Doren, and Gregg B. Fields. The Role of Collagen Charge Clusters in the Modulation of Matrix Metalloproteinase Activity. *J. Biol. Chem*. **289**,1981-1992 (2014).
4. Anais Chavaroche, Mare Cudic, Marc Giulianotti, Richard A. Houghten, Gregg B. Fields, and Dmitriy Minond. Glycosylation of A Disintegrin And Metalloprotease 17 (ADAM17) Affects its Activity and Inhibition. *Anal. Biochem.* **449**, 68-75 (2014).

5. Sonia Pahwa, Maciej J. Stawikowski, and Gregg B. Fields. Monitoring and inhibiting MT1-MMP during cancer initiation and progression. *Cancers* **6**, 416-435 (2014).

E. Synergistic Activities (up to five)

1. Purchase of a 500 MHz Nuclear Magnetic Resonance Spectrometer, Kresge Foundation Science Initiative (Drs. Hank Steele, John Wiesenfeld, Gregg B. Fields, and Frank Marí, Co-P.I.), 1998-2000.
2. MBRS Support of Continuous Research Excellence (SCORE) at Florida Atlantic University, National Institutes of Health 1S06GM073621 (Gregg B. Fields, Program Director), 2005-2009.
3. Florida Atlantic University Institutional Research Grant, American Cancer Society IRG-08-063-01 (Gregg B. Fields, Program Director), 2008-2010.

F. Collaborators and Other Affiliations

Barry Edwards, University of Pittsburgh; John Hart, UTHSCSA; Rikard Holmdahl, Karolinska Institute; Merry Lindsey, University of Mississippi, Jackson; Claudio Luchinat, University of Florence; Linda Malkas, City of Hope Cancer Institute, Duarte, CA; William Roush, Scripps Florida, Jupiter; Irit Sagi, The Weizmann Institute, Tel Aviv, Israel; Michael Selsted, University of Southern California; Bjorn Steffensen, Tufts University, Boston; Alex Strongin, The Sanford Burnham Research Institute, La Jolla, CA; Steven Van Doren, University of Missouri, Columbia; Stephen Weiss, University of Michigan, Ann Arbor.

G. Courses Taught

Cell Biology of the Extracellular Matrix; Adv. Biochem. 1: Protein Structure & Function; Proteins & Enzymes; Biochemistry I; Biochemistry II; Advanced Biochemistry; Medicinal Chemistry; Medical Biochemistry; Biomolecular Interactions.

H. Community Engagement or Out-reach

Member, Executive Steering Committee and Industry Advisory Council, Banner Center for Life Sciences, 2012.
Member, Advisory Board, Ali's Alliance: The Alison Arnesen Cowan Cancer Resource & Support List, 2012-present.
Member, Palm Beach State College Biotechnology Business Partnership Council, 2013-2014.

ABBREVIATED FACULTY CV
Jerome E. Haky, Ph.D.

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Department of Chemistry and Biochemistry
777 Glades Rd, Boca Raton, FL 33431
PS 55, rm 110

phone: (561) 297-3338
fax: (561) 297-2759
email: hakyj@fau.edu

A. Professional Preparation

Cleveland State University	B.S.	1976
Case Western Reserve University	M.S.	1977
Case Western Reserve University	Chem.Ph.D.	1981

B. Appointments

2000-present **Associate Chair**, Department of Chemistry and Biochemistry, Florida Atlantic University
1993-present **Associate Professor** with tenure, Department of Chemistry and Biochemistry, Florida Atlantic University
1988-1993 **Assistant Professor**, Department of Chemistry and Biochemistry, Florida Atlantic University
1985-1988 **Instructor** (part-time), Chemistry Department, Lawrence Institute of Technology, Southfield, Michigan
1982-1988 **Senior Scientist**, Chemistry Department, Parke-Davis Company, Pharmaceutical Research Division, Ann Arbor, Michigan.
1980-1982 **Scientist I**, Chemical Carcinogenesis Program, Frederick Cancer Research Center, Frederick, Maryland

C. Related Publications

1. Chamely-Wiik, D., Haky, J., Louda, D., Romance. "SQER3: A Instructional Framework for Using Scientific Inquiry to Design Classroom Demonstrations*."* *Journal of Chemical Education*, 2014, 91 (3), 329–33, 2014.
2. Chamely-Wiik, D. Haky, J., Galin J. "From Bhopal to Cold Fusion: A Case Study Approach to Writing Assignments in Honors General Chemistry." *Journal of Chemical Education,* 89 (4), 502–508, 2012.
3. Chamely-Wiik, D., Galin, J.R., Kasdorf, K., Haky, J. E. (2009) "Combining chemistry and college writing: a new model for an honors undergraduate chemistry course" *Honors in Practice*, 5, 77-96.
4. Chamely-Wiik, D., Haky, J.E., Carraher, C.E. (2006) "Separation and HPLC analysis of diastereomers and rotational isomers of L-*N*-(Butyloxycarbonyl)-3-(3-hydroxyethyl-4-(benzyloxy)-phenyl) alanine Benzyl Ester." *Journal of Liquid Chromatography,* 29, 1877-1890.
5. Haky, J.E., Louda, D.W., Carraher, C., Romance, N., Chamely, D., Huchital, D. (2004) Project ChemBOND: The restructuring of introductory undergraduate Chemistry, Abstracts of Papers, 18th Biennial Conference on Chemical Education, Ames, IA.

D. Synergistic Activities

1. Associate Editor of the Journal of Liquid Chromatography and Related Technologies
2. Florida Atlantic University (FAU) Undergraduate Programs Committee
3. FAU College of Science Graduate Programs Committee

4. College of Science Committee on Secondary School Science Curriculum and Teacher Training
5. FAU College of Science Faculty Assembly, Chair

E. Collaborators and Other Affiliations

i. *Collaborators and Co-Editors:* Drs. Andrew Terentis, Deborah Louda, Nancy Romance, Evonne Rezler, Charles Carraher and Donna Chamely-Wiik at Florida Atlantic University; Llanie Bandell. Assistant Prosecutor, Broward County, FL; Dunn and Associates Engineering, Boca Raton, FL; Everglades Environmental Laboratories, West Palm Beach, FL; GeoSyntec Consultants, Boca Raton, Florida; Prentice-Hall Publishers, New York; South Florida Water Management District.

ii. *Graduate Advisors and Postdoctoral Sponsors:* Prof. J. Eric Nordlander, deceased (Ph.D. thesis advisor).

iii. *Graduate Student and Postdoctoral Advisees:* Thesis Advisees (1997-present):
J. Brady, M. Calixte, D. Chamely, B. Corlay, D. Creelman, V. Ferguson, J. Goldberg, R. McCormack, H. Schulz, D. Williams, A. Zaplatynski, S. Hyvarinen (joint with Drs. Rezler and Terentis)

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EXECUTIVE PROFILE

Dynamic Operations and Marketing Career/Leadership Training and Development/P&L Management/Organizational Development and Management Performance Optimization

Dynamic management career leading organizations through start-up, change, revitalization and accelerated growth. Cross-functional expertise with proven success in optimization, organizational growth, productivity and efficiency. HR Generalist experienced in compensation, recruitment, and training. Expert in team building and interpersonal relations skills. Strategic and analytical with outstanding problem solving and negotiating skills. Regional and National distribution experience.

PROFESSIONAL EXPERIENCE

Director of Labs
Florida Atlantic University, Boca Raton, Florida

CHALLENGE: Organize and redeveloped laboratory experiments for a General Chemistry I and II lab course. Rewrite a new version of the existing laboratory books with emphasis on newer technology and incorporating virtual experiments. Hire new Teaching Assistants (34 total) and organize their introductory lecture to students. Write a grading rubric for clear grading procedures. Hire prep assistants to make chemicals that are consistent and standardized. Oversee all aspects of the teaching labs as well as entering grades and safety protocol. Teach Chemistry for Health Science (nursing Chem.) as well as the associated lab. Organize on line class for a virtual lab to be tried in the spring of 2014. Write Technology Fee grants to replace aging computers and equipment in the labs.

Senior Vice-President
Pro-Chem Chemical Company, West Palm Beach, Florida

CHALLENGE: Launch and build an entrepreneurial venture within an intensely competitive consumer market and create a strong organizational infrastructure to support continued growth and market penetration.

- Senior executive with full responsibility for business development, operations, marketing and sales, and P & L performance of multiple product lines. Build the entire organizational infrastructure, create accounting and financial reporting processes and implemented computer technology to support operations.
- Build new venture from concept to more than $2 million in annual sales with a 40% profit margin.
- Create training programs for all distributors and sales personnel.
- Interface with University and corporate researchers in the development and implementation of all research projects.
- Organized and implemented new product introduction and trials at U.S. Navy, Northrop Grumman, Electric Boat and other shipbuilding companies.

June 1997 - present

International Sales Manager
AIM Corp., West Palm Beach, Florida

CHALLENGE: Facilitate market and revenue growth for a specialty import/export company.

- Recruited by CEO to assist with building a profitable international business venture. Sole responsibility spanned to all core executive functions with particular emphasis on organizational design, Banking – Letters of Credit and Bills of Lading, shipping – inland and overseas, sales and marketing to South America and Mid-Eastern countries.
- Established communication lines to suppliers in eastern, mid-west and southern states.
- Created organizational infrastructure to handle all outbound shipments to South America and United Arab Emirates.
- Established Lines of Credit with customers and procedures for payments.
- Drove gross margins from 40% to 63% and captured record $1,040,000 net profit.
- Negotiated custom, ship manifests, and freight forwarding documents.

Jan 1980-1995

Regional Sales Manager
Boehringer Mannheim Biochemical, Indianapolis, Indiana

CHALLENGE: Organize and establish a 10 state sales region in the Southeast. Build new accounts and increase revenue to national standards. Establish a program to support growth and expansion of a HR organization.

- Recruited to plan and orchestrate a complete regional operation. Establish routes and routines for a sales force as well as call records and expenses.
- Led the region through a successful transition and created core business processes to support change and create corporate image.
- Increased annual revenue by 400% for the region.
- Established $3 Million /month sales revenue for the southeast region.

1976-1980

HONORS AND AWARDS

Research Associate
University of Tennessee – Dept. of Biochemistry
East Tennessee Heart Association grant recipient
1975-1976

Research Assistant
Tulane University, New Orleans, Louisiana
The presence of a circular chromosome in Tradescantia Virginiana ; a unique occurrence or a preview to a new tool. H. Garrison Wilkes , Patrick Ande ; Journal of Biochem 1968 --- Presentation of results at THE INTERNATIONAL SYMPOSIUM OF CHEMIST AND BIOCHEMIST, CHICAGO, Illinois / 1969.

Nominated for the Carnegie Award for Heroism - 1969

EDUCATION

MS Degree; BIOCHEMISTRY, University of Tennessee,
Knoxville, Tn. 1975
BS Degree; Biology and Chemistry, Tulane University,
New Orleans, La. 1971

PROFESSIONAL AFFILIATIONS
American Chemical Society of America
Tulane University Alumni President Palm Beach chapter
National Shipbuilding Research Panel
Golf Course Superintendent Association of America

TEACHING
Florida Atlantic University:
General Chemistry 1 & 2 Laboratory courses 2011 - present
General Chemistry 1 & 2 Lecture and Lab courses 1995 – 2002

University of Tenn.:
Biology 1 - Graduate TA, 1972 – 1974

South College, West Palm Beach:
Chemistry for Nursing, Biology 1&2, 1998 – 2000

ABBREVIATED FACULTY CV
Charles Carraher

A. EDUCATION

B.S. 1963 Chemistry, Sterling College
Ph.D. 1967 Chemistry, University of Missouri, Kansas City

B. PROFESSIONAL EXPERIENCE

1967-1968 Instructor, University of South Dakota
1968-1970 Assistant Professor, University of South Dakota
1970-1973 Associate Professor, University of South Dakota
1971-1974 Chairman of Science Division, University of South Dakota
1973-1976 Professor, University of South Dakota
1976-1984 Professor and Chairman, Department of Chemistry, Wright State University
1983-1985 Professor of Chemistry and Chair of University-Industry/Community Cooperation, Wright State University
1985-1995 Professor of Chemistry and Dean, College of Science, Florida Atlantic University
1995-Present Professor of Chemistry and Biochemistry

C. Recent Publications

C. Carraher, M. Roner, Organotin Polymers as Anticancer and Antiviral Agents, J. Organomet. Chem., 751, 67-82, 2014, part of 50 year anniversary issue.

C. Carraher, A. Morrison, M. Roner, A. Moric, N. Trang, Synthesis and Characterization of Organotin Polyesters Derived from 3,5-Pyridinedicarboxylic Acid, J. Inorg. Organomet. Polym., 24, 182-189, 2014.

C. Carraher, M. Roner, K. Shahi, A. Battin, G. Barot, Organotin Polymers As Chemotherapeutic Agents in the Treatment of Cancer: General, J. Polym. Mater., 31, 317-338, 2014.

C. Carraher, M. Roner, K. Shahi, A. Battin, G. Barot, T. Arnold, Organotin Polymers in Treatment of Breast and Pancreatic Cancers, J. Polym. Mater., 31,1-14, 2014.

C. Carraher, N. Truong, M. Roner, A. Moric, N. Trang, Synthesis of organoarsenic, organoantimony, and organobismuth poly(ether esters) from reaction with glycyrrhetinic acid and their preliminary activity against pancreatic cancer cell lines, JCAMS 1, 134-150, 2013.

C. Carraher, G. Barot, K. Shahi, M. Roner, Influence of DMSO on the Inhibition of Various Cancer Cells by Water Soluble Organotin Polyethers, JCAMS, 1,294-304, 2013.

D. Selected Other Publications or Products/Grants

Integration of Macromolecular/Polymeric Topics Within the Foundational Organic Chemistry Content and the Polymer Education Committee, Cpt. 1, 1-11, 2013, ACS Symposium Series; American Chemical Society, Washington, DC 2013; Peer Reviewed Book Chapter, with B. Howell, W. Ford, S. Droske. I am the chief author.

E. Collaborators with other affiliations

Mike Roner, U. Texas Arlington, TX.

F. Courses Taught

Introduction to Chemistry CHM 1025
Contemporary Chemical Issues CHM 1020

G. Community Engagement or Out-Reach

Associate Director, Florida Center for Environmental Studies
American Chemical Society (ACS), Committee on Professional Training (CPT), polymer section

Curriculum Vitae: Donna Chamely-Wiik, Ph.D.

Department of Chemistry and Biochemistry
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431-0991

Phone: 561-297-0046, 561-297-1019
Fax: 561-297-2759
Email: dchamely@fau.edu

A. Professional Preparation

2000-2004: **Ph.D. Chemistry**, Florida Atlantic University, Boca Raton, FL.
Dissertation: Synthesis and structural characterization of intermediates towards the preparation of a polyphosphonate ester containing L-Dopa for the potential treatment of Parkinson's disease.

1999-2000: **M.S. Chemistry**, Florida Atlantic University, Boca Raton, FL.
Thesis Title: Synthesis and structural characterization of organotin and group IVB metallocene dichlorides with kinetin.

1995-1998 **B.S. Chemistry**, Florida Atlantic University, Boca Raton, FL.

B. Appointments

2014-Present **Associate Scientist,** Department of Chemistry and Biochemistry, Florida Atlantic University, Boca Raton, Fl.

2011-Present **Director,** University's Quality Enhancement Plan (QEP), Florida Atlantic University, Boca Raton, Fl.

2007-Present **Assistant Scientist/Scholar**, Department of Chemistry and Biochemistry, Florida Atlantic University, Boca Raton, Fl.

2004-2007 **Instructor and Director of Introductory Laboratories,** Department of Chemistry and Biochemistry, Florida Atlantic University, Boca Raton, Fl.

C. Selected Peer-Reviewed Publications

1. **Chamely-Wiik, D.,** Holman, M., Kirsch, P., Meeroff, D., and Peluso, J. Scaffolding the development of student research skills for capstone experiences: A multi-disciplinary approach. *Council of Undergraduate Research Quarterly*, 2014, 34(4), 18-25, 2014.
2. **Chamely-Wiik, D.,** Haky, J., Louda, D., Romance. "SQER3: A Instructional Framework for Using Scientific Inquiry to Design Classroom Demonstrations*." Journal of Chemical Education*, 2014, 91 (3), 329–33, 2014.
3. **Chamely-Wiik, D.** Haky, J., Galin J. "From Bhopal to Cold Fusion: A Case Study Approach to Writing Assignments in Honors General Chemistry." *Journal of Chemical Education,* 89 (4), 502–508, 2012.
4. **Chamely-Wiik, D.** Galin, J., Kasdorf, K. Haky, J. "Combining Chemistry and College Writing: A New Model for an Honors Undergraduate Chemistry Course." *Honors in Practice,* 5, 77-96, 2009.
5. Carraher, C.E., **Chamely-Wiik, D.,** Carraher S.M., Barot, G., Stewart, H. "Synthesis of Group IV B Metallocene Polymers Containing the Plant Growth Hormone Kinetin, and their influences on the seed germination of old and damaged food crop seed." *Journal of Polymer Materials.* 24 (2), 149-162, 2007.

D. Selected Other Publications or Products/Grants

1. Project ChemBOND: The Next Generation
National Science Foundation-GK-12 Grant, DGE # 0638662
D. Chamely-Wiik (PI) March 2007-May 2014 **$2,558,552**

2. The Research, Advancement & Innovation for Scientific Excellence – Undergrad Pipelines: RAISE UP
Planning Grants for NIH Building Infrastructure Leading to Diversity (BUILD) Initiative (P20)
D. Chamely-Wiik (Key personnel) September 2013-March 2014 **$150,000**

1. *TURI: Technology for Undergraduate Research and Inquiry*
Florida Atlantic University Technology Grant Program
D. Chamely-Wiik (PI) May 2013-August 2016 **$69,730**

3. Freeman Summer Undergraduate Research Fellowship Program
Freeman Foundation,
D. Chamely-Wiik (PI) August 2011-August 2012 **$4,500**

4. Shifting Responsibilities: When Chemistry Replaces First-Year College Writing
National Science Foundation -CCLI Phase 1, DUE # 0632894
D. Chamely-Wiik (Co-PI) January 2007-December 2010 **$149,363**

E. Synergistic Activities

NSF Grant Reviewer: GK-12 Program, Arlington, VA.	2009
Journal of Chemical Education manuscript reviewer	2011-present
International Journal of Science and Math Education manuscript reviewer	2009-present
The Chemist manuscript reviewer	2013-present

F. Collaborators and Other Affiliations

Robert Potter, Associate Dean, College of Science, University of South Florida
Daniel Meeroff, Florida Atlantic University, Professor of Geomatics Engineering
Jeffery Galin, Florida Atlantic University, Associate Professor of English
Nancy Romance, Florida Atlantic University, Professor of Science Education
Kimberly Schneider, Director, Office of Undergraduate Research, University of Central Florida

G. Courses Taught

Organic Chemistry I, General Chemistry II, Honors General Chemistry II, Honors Composition for Science, General Chemistry I and II Laboratory, Organic Chemistry Laboratory, Research in Chemical Education

H. Community Engagement or Out-reach

Science Olympiad Event Supervisor (2011-present), Life Sciences South Florida Symposium organizing committee (2012-present)

ABBREVIATED BIOGRAPHICAL SKETCH
Mare Cudic, Ph. D.

A. Professional Preparation

1990	University of Zagreb, Zagreb, Croatia	B.Sc., Chemistry
1993	University of Zagreb, Zagreb, Croatia	M.Sc., Organic Chemistry
1996	University of Zagreb, Zagreb, Croatia	Ph. D., Organic chemistry
1997-1998	CNRS, Gif-sur-Yvette, France	Postdoctoral Fellow
1998	College of France, Paris, France	Postdoctoral Fellow
1998-2000	The Wistar Institute, Philadelphia	Postdoctoral Fellow

B. Appointments

2014-present	*Assistant Professor*, Florida Atlantic University, Boca Raton, FL
2014	*Visiting Professor*, Nova Southeastern University, Davie, FL
2010-2013	*Assistant Member*, Torrey Pines Institute for Molecular Studies, Port St. Lucie, FL
2007-2009	*Research Assistant Professor*, Florida Atlantic University, Boca Raton, FL
2003-2007	*Research Associate*, Florida Atlantic University, Boca Raton, FL
2003-2003	*Research Director*, Chaperone Technologies, Audubon, PA
2000-2003	*Staff Scientist*, The Wistar Institute, Philadelphia, PA

C. Selected Peer-Reviewed Publications

1. M. J. Stawikowski, B. Aukszi, R. Stawikowska, **M. Cudic**, and G. B. Fields (2014) Glycosylation modulates melanoma cell α2β1 and α3β1 integrin interaction with type IV collagen. *J. Biol. Chem.* **289**: 21591-604.
2. S. Yegorova, A. E. Chavaroche, M. C. Rodriguez, D. Minond, and **M. Cudic** (2013) Development of an AlphaScreen assay for discovery of inhibitors of low affinity glycan-lectin interactions. *Anal. Biochem.* **439**: 123-31
3. M. Rodriguez and **M. Cudic** (2013) Optimization of physicochemical and pharmacological properties of peptide drugs by glycosylation. *Methods Mol Biol.* **1081**: 107-36.
4. A. Yongye, L. Calle, A. Arda, J. Jimenez-Barbero, S. André, H.-J. Gabius, K. Martinez-Mayorga, and **M. Cudic** (2012) Molecular Recognition of TF antigen-Threonine Conjugate by Adhesion/Growth Regulatory Galectin-3: NMR Studies and Molecular Dynamics Simulations. *Biochemistry* **51**: 7278-7289.
5. D. Minond, **M. Cudic**, N. Bionda, M. Giulianotti, L. Maida, R. A. Houghten, and G. B. Fields. (2012) Discovery of Novel Inhibitors of A Disintegrin And Metalloprotease 17 (ADAM17) Using Glycosylated and Non-Glycosylated Substrates. *J. Biol. Chem.* **287**: 36473-87.

D. Selected Other Publications or Products/Grants

1. Grant: R21 NIH/NCI 09/012014 - 08/312014 (M. Cudic, PI)
Novel synthetic tools for mucin glycobiology

2. **M. Cudic**, F. Marí, and G. B. Fields (2007) Synthesis and solid-phase application of suitably protected γ-hydroxyvaline building blocks. *J. Org. Chem.* **72**: 5581-5586.

3. **M. Cudic**, and G. B. Fields (2009) Extracellular proteases as targets for drug development. Curr. Protein Pept. Sci. **10**: 297-307.
4. **M. Cudic**, G.D. Burstein, G.B. Fields & J. Lauer-Fields. (2010) Analysis of flavonoid-based pharmacophores that inhibit aggrecanases (ADAMTS-4 and ADAMTS-5) and matrix metalloproteinases through the use of topologically constrained peptide substrates. *Chem. Biol. Drug Design,* **74**: 473-482.
5. N. Bionda, **M. Cudic**, L. Barisic, M. Stawikowski, R. Stawikowska, D. Binetti, P. Cudic, A Practical (2012) Synthesis of N^{α}-Fmoc Protected L-*threo*-β-hydroxyaspartic Acid Derivatives for Coupling *via* α- or β-Carboxylic Group. *Amino Acids,* **42**: 285-93.

E. Synergistic Activities

Member of the American Peptide Society
Member of the American Chemical Society
Reviewer for the Biochemistry, Antimicrobial Agents and Chemotherapy, Protein and Peptide Letters, European Journal of Pharmaceutical Sciences, and International Journal of Peptide Research and Therapeutics.

F. Collaborators and Other Affiliations

*Dr. Jesus Jimenez-Barbero***,** Centre for Biological Research **(**CIB-CSIC), Chemical and Physical Biology Department, Madrid, Spain. NMR studies of the conformation and dynamics of the molecular recognition processes between tumor-associated MUC1 glycopeptides and galectin-3.
Dr. Hans-Joachim Gabius, Institute of Physiologcal Chemistry, Faculty of Veterinary Medicine, Ludwig-Maximilians-University, Munich, Germany. Structure-activity studies of carbohydrate ligands by human galectins.
Dr. Barbara Mueller, San Diego Biomedical Research Institute, San Diego, California, Cancer biology collaborator to study metastasis inhibition in a mouse model of breast metastatic cancer.
Dr. Olivera Finn, University of Pittsburgh, Chair, Department of Immunology, Pittsburgh, PA, Development of new therapeutic strategy for metastatic cancer that would combine the MUC1-based cancer vaccine and anti-galectin therapy.
Dr. Andrew Terentis and Dr. Evonne Rezler, Florida Atlantic University, Department of Chemistry and Biochemistry, Boca Raton, FL Design and synthesis of cell penetrating peptides and their secondary structure determination in live cells with Raman microscopy.
Dr. Salvatore Lepore, Florida Atlantic University, Department of Chemistry and Biochemistry, Boca Raton, FL Novel synthetic approaches towards stereospecific formation of glycosidic bond.
Dr. Xupei Huang, Florida Atlantic University, Biomedical Sciences, College of Medicine, Boca Raton, FL The potential therapeutic effects of galectin-3 inhibitors on heart disease and heart failure.

G. Courses Taught

Fall 2014 CHM 6720: Kinetics and energetics of reactions

H. Community Engagement or Out-reach

2013 St. Lucie County Regional Science & Engineering Fair for high school students
2013 Young Investigators Poster competition judge, 23rd Am. Peptide Symposium
2014 Nova Southeastern University, Undergraduate Student Symposium judge

Dr. Daniel T. de Lill, Biographical Sketch

A. Professional Preparation

Lock Haven University of Pennsylvania	Chemistry/French	BA, 2000
The George Washington University	Inorganic Chemistry	MPhil, 2006; PhD, 2008
University of Nevada, Reno	Postdoc	2008-2010

NSF American Competitiveness in Chemistry postdoctoral fellow (2009-2010) studying lanthanide coordination chemistry and luminescence

B. Appointments

Florida Atlantic University, Department of Chemistry & Biochemistry
Assistant Professor, 2010-current
Courses Taught: Inorganic Chemistry, Quantitative Analysis, Topics in Physical Chemistry (graduate level), Materials Chemistry (undergraduate/graduate course), Advanced Inorganic Chemistry (graduate), Directed Independent Study (undergraduate research, 34 students in 4 years); Instrumentation and Characterization (graduate level; thermogravimetric analysis module).

C. Selected Publications (Products)

1. N. E. Greig, J. D. Einkauf, J. M. Clark, E. J. Corcoran, J. P. Karram, C. A. Kent, V. E. Eugene, B. C. Chan, and **D. T. de Lill,** "Luminescent lanthanide coordination polymers synthesized via *in-situ* hydrolysis of dimethyl-3,4-furandicarboxylate." **In submission**, *Journal of Solid State Chemistry.*

2. A. L. Ramirez, K. E. Knope, T. T. Kelley, J. E. Einkauf, N. E. Greig, **D. T. de Lill**, "Structure and luminescence of a 2-dimensional 2,3-pyridinedicarboxylate coordination polymer constructed from lanthanide(III) dimers." *Inorganica Chimica Acta*, **392**, 46-51, **2012**.

3. **D. T. de Lill** and B. C. Chan, "Synthesis, structure, and luminescence of a one-dimensional uranium-benzophenonedicarboxylate coordination polymer." *Inorganica Chimica Acta*, **404**, 215-218, **2013**.

4. A. L. Ramirez, B. C. Chan, D. T. de Lill, "Benzodithiophene-4,8-dione." *Acta Cryst.*, **E68**, o1428, **2012**.

5. C. L. Cahill, **D. T. de Lill**, and M. Frisch, "Homo- and Heterometallic Coordination Polymers from the f-Elements." *CrystEngComm* (**Highlight Article**; **Cover Article**), **9**, 15-26, **2007**.

6. **D. T. de Lill** and C. L. Cahill, "Coordination Polymers of the Lanthanide Elements : A Structural Survey." *Progress in Inorganic Chemistry*, **55**, 143-203, **2007**. (**reviewed**: *J. Am. Chem. Soc.*, **130**, 2878-2882, **2008**.)

7. **D. T. de Lill**, A. de Bettencourt-Dias, and C. L. Cahill, "Exploring Lanthanide Luminescence in Metal-Organic Frameworks: Synthesis, Structure, and Guest-Sensitized Luminescence of a Mixed Europium/Terbium-Adipate Framework and a Terbium-Adipate Framework." *Inorganic Chemistry,* **46(10)**, 3960-3965, **2007**.

8. K. E. Knope, **D. T. de Lill**, C. E. Rowland, P. M. Cantos, A. de Bettencourt-Dias, C. L. Cahill, "Uranyl sensitization of Sm(III) luminescence in a 2-dimensional coordination polymer." *Inorganic Chemistry*, **51(1)**, 201-206, **2011. (Cover Article)**

9. A. de Bettencourt-Dias, P. Barber, S. Viswanathan, **D. T. de Lill**, G. Ling, M. A. Ayuk, "Para-derivatized pybox and its highly luminescent Eu(III) and Tb(III) complexes." *Inorganic Chemistry*, **49(19)**, 8848-8861, **2010**.

10. **D. T. de Lill** and C. L. Cahill, "An unusually high thermal stability within a novel lanthanide-organic framework: Synthesis, structure, and thermal properties." *Chemical Communications*, **47**, 4946-4948, **2006**.

D. Synergistic Activities

1. Grant Reviewer
    a. National Science Foundation (ACC-F), July 2011
    b. U.S. Department of Energy (SCGF), March 2012

2. Journal Referee
    a. Acta Crystallographica, Section C
    b. Crystal Growth & Design
    c. European Journal of Inorganic Chemistry

d. Inorganica Chimica Acta
e. Dalton Transactions
f. Inorganic Chemistry Communications
g. Physical Chemistry Chemical Physics
h. Journal of Solid State Chemistry
i. Journal of Chemical Crystallography

4. Seminars and Conference Proceedings
a. (invited) Oral contribution to SERMACS, 11/2013
b. (invited) Oral contribution to FAME (Florida Annual Meeting & Exposition; ACS), 5/13.
c. (invited) Oral contribution to NanoFlorida, 10/11.
d. (invited) Seminar, Florida International University, CeSMEC, 3/11
e. (invited) Seminar, Barry University (Miami, Fl), Dept. of Chemistry, 5/11
f. (invited) Seminar, Florida International University, Dept. of Chemistry, 12/11
g. (invited) Seminar, Broward College North Campus, 10/14
g. Poster presentation, Rare Earths Research Conference, Santa Fe, NM, 6/11

5. Course Development
a. Materials Chemistry: An upper level undergraduate/lower level graduate course
b. Advanced Inorganic Chemistry: An upper level undergraduate/lower level graduate course
d. Proposed and facilitated a Faculty Learning Community on developing dual-listed undergraduate/graduate courses.
e. Awarded an internal curriculum grant through the Quality Enhancement Plan to develop an inquiry-based Inorganic Chemistry course to replace the current course.

6. Summer Research Experience
a. Each summer, Dr. Jennifer Kalish, a local Palm Beach County chemistry teacher arranges research opportunities for her best students in my laboratory. This is a structured program in which the students work on their own independent project that is related to work done in my lab.

E. Collaborations and Other Affiliations

I have collaborated with these individuals over the past 48 months.
Dr. James Brenner, Florida Institute of Technology
Dr. Benny Chan, The College of New Jersey
Dr. Karah Knope, Georgetown University
Dr. Ralph Zehnder, Angelo State University
Dr. Raphael Raptis, Florida International University

Previous Advisors and Affiliations:
Dr. Christopher Cahill, The George Washington University
Dr. Ana de Bettencourt-Dias, University of Nevada, Reno

Graduate Students Directed
Donella Beckwith (Ph.D., in progress)
Joseph Dixon (M.S., in progress)
Jeffrey Einkauf (Ph.D., in progress)
Jessica Clark (M.S., 8/2013)
Natalie Greig (M.S., 12/2012)
Amanda Ramirez (M.S., 8/2013)

Deguo Du

Florida Atlantic University
Department of Chemistry and Biochemistry
777 Glades Road
Boca Raton, FL 33431
Phone: (561) 297-0094; Fax: (561) 297-2759
Email address:ddu@fau.edu

Professional Preparation

Tsinghua University, Beijing, China; Chemistry, B.S., 1998
Tsinghua University, Beijing, China; Analytical Chemistry, M.S., 2001
University of Pennsylvania, Philadelphia, USA; Biological Chemistry, Ph.D., 2006
The Scripps Research Institute, San Diego, USA; Research Associate, 2007-2010

Appointments

Assistant Professor, Department of Chemistry and Biochemistry, Florida Atlantic University, 2010–present

Selected Publications

Markiewicz, B. N., Oyola, R., **Du, D.***, and Gai, F.* (2014) Aggregation gatekeeper and controlled assembly of Trpzip β-hairpins. *Biochemistry* 53:1146-1154.

Ojha, B., Liu, H., Dutta, S., Rao, P. P., Wojcikiewicz, W. P., and **Du, D.*** (2013) Poly(4-styrenesulfonate) as an inhibitor of Aβ40 amyloid fibril formation. *J. Phys. Chem. B.* 117:13975-13984.

Du, D., Liu, H., and Ojha, B. (2013) "Study protein folding and aggregation using nonnatural amino acid *p*-cyanophenylalanine as a sensitive optical probe" *Methods Mol. Biol.* 1081:77-89.

Du, D., Cohen, E., Kim, H., Simkovsky, R., Dillin, A., and Kelly, J. W. (2011) A kinetic aggregation assay enabling sensitive and sensitive Aβ amyloid quantification in cells and tissues. *Biochemistry* 50:1607-1617.

Cohen, E., **Du, D.,** Joyce, D., Kapernick, E. A., Volovik, Y., Kelly, J. W., and Dillin, A. (2010) Temporal requirements of insulin/IGF-1 signaling for proteotoxicity protection. *Aging Cell* 9:126-134.

Selected Other Publications

Fuller, A. A., **Du, D.,** Liu, F., Davoren, J. E., Kroon, G., Dyson, H. J., Powers, E. T., Wipf, P., Gruebele, M., and Kelly, J. W. (2009) Evaluating β-turn mimics as β-sheet folding nucleators. *Proc. Natl. Acad. Sci. USA* 106:11067-11072.

Liu, F., **Du, D.**, Fuller, A. A., Davoren, J. E., Wipf, P., Kelly, J. W., and Gruebele, M. "An experimental survey of the transition between two-state and downhill protein folding scenarios." *Proc. Natl. Acad. Sci. USA* 2008, 105, 2369-2374.

Du, D., Bunagan, M. R., and Gai, F. "The effect of charge-charge interactions on the kinetics of β-helix formation." *Biophys. J.* 2007, 93, 4076-4082.

Du, D., and Gai, F. "Understanding the folding mechanism of helix-hairpin." *Biochemistry* 2006, 45, 13131-13139.

Du, D., Zhu, Y., Huang, C. Y., and Gai, F. "Understanding the key factors that control the rate of β-hairpin folding." *Proc. Natl. Acad. Sci. USA* 2004, 101, 15915-15920.

Synergistic Activities

Mentoring lab research of Directed Independent Study (DIS) undergraduate students at Florida Atlantic University

Mentoring summer research program in the lab for high school students from the local West Boca Raton High School

Collaborators & Other Affiliations

Project Collaborators: Feng Gai (University of Pennsylvania), Madepalli Lakshmana (Torrey Pines Institute for Molecular Studies), Chenzhong Li (Florida International University), Rolando Oyola (University of Puerto Rico-Humacao), Praveen P. Nekkar Rao (University of Waterloo), Andrew Terentis (Florida Atlantic University), Lyndon West (Florida Atlantic University), Ewa Wojcikiewicz (Florida Atlantic University).

Ph.D. thesis advisor: Feng Gai (University of Pennsylvania)

Postdoctoral supervisor: Jeffery W. Kelly (The Scripps Research Institute)

Former graduate student: Ahmad Alex Hijazi (West Virginia University)

Former Postdoctoral researcher: Bimlesh Ojha (Tottori University)

Courses Taught

BCH 3034 Biochemistry II
CHML 6157 Instrumentation
CHML 4139 Bioanalytical Instrumentation Lab

Alberto Haces, Ph.D. Abbreviated Curriculum Vitae

Name: Alberto Haces
Institutional Affiliation: Florida Atlantic University
Contact Information: phone: 561-297-3641; e-mail: ahaces@fau.edu

Education/Employment History

EDUCATION:

University	Major	Degree	Dates
University of California	Organic Chemistry	Ph.D.	1980-1982
University of California	Chemistry	M.S.	1978-1980
GPA: 3.77/4.00			
National Institutes of Health (NIH)	Fogarty Fellow		1983-1985
Johns Hopkins University	Postdoctoral Fellow		1986-1987

Employment History:

Florida Atlantic University

Boca Raton, FL

Senior Instructor of Chemistry and Biochemistry.

Graduate Faculty(5 years) ***June 2003 to present***

Broward College

Fort Lauderdale, FL

Adjunct Professor ***Jan. 2002 – June 2003***

Scholarship/Research/Creative Activity

Academic publications:

01) James Kumi-Diaka, Kendra Merchant, Alberto Haces, Vanessa Hormann, Michelle Johnson. Journal of Medicinal Food. August 2010, 13(4): 842-850

02) Nagalakshmi Jeedimalla†, Madison Flint, Alberto Haces, Dmitriy Minond and Stéphane P. Roche, J. Med. Chem. (submitted)

Books:

- **Author(s):** Alberto Haces, General Chemistry, **ISBN:** 9781615495030, Great River Learning, publisher, 2012

Collaborations/Support:

Dr. James Kumi-Diaka, FAU Biology Dept. Davie Campus

Dr. Stephane Roche, FAU Chemistry and Biochemistry Dept. Boca Raton

Dr. Janet Blanks, Director, Center for Complex Systems and Brain Sciences
College of Science Florida Atlantic University, Boca Raton and Jupiter Campuses

Dr. Robert Stackman, FAU Neuroscience and Behavioral studies Dept, Jupiter Campus

Dr. Kenneth Scully-Dawson, FAU Biology Dept., Jupiter Campus

Courses Taught at FAU

BCH 3033: Biochemistry 1, BCH 3034: Biochemistry 2, BCHL 3033L: Biochemistry Laboratory, CHM1025: Introductory General Chemistry, CHM2045: General Chemistry 1, CHM2046: General Chemistry 2, CHM3410: Physical Chemistry 1 and CHM3410L (and its Laboratory), CHM3411: Physical Chemistry 2 and CHM341L (and its laboratory), CHM3400: Introductory Physical Chemistry, CHM2032Chemistry for Health Sciences and CHM2032L (its laboratory), NUR3183: Food and Nutrition. Will teach organic chemistry 1 in the spring 2015

Courses Taught at Broward College

General chemistry for health sciences majors, lecture and labs (CHM1033 and CHM 1033L, two terms), general chemistry expanded sequence (CHM 1040, 1041) and its corresponding laboratory (CHM 1045L).

Service and Professional Development

Summer of 2009

I taught chemistry/biochemistry to children from ages 8-14 at the Coral Spring, Broward Public Library with my DIS student, Ms. Monique Jaquith.

DANIEL H. HUCHITAL, Ph.D.
Department of Chemistry & Biochemistry
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431

(561) 297-3396
Email: huchital@fau.edu

EDUCATION

Ph.D. 1965	Stanford University
BSc 1961	City University of New York

UNIVERSITY & RESEARCH EXPERIENCE

April 1965 – May 1966	State University of New York (Buffalo) – Postdoctoral
May 1966 – August 1966	Brookhaven National Laboratory – Visiting Researcher
1966 – May 2002	Seton Hall University – Faculty member
1972-1973	Texas A&M University – Visiting Research Professor
1974 – 1977	Seton Hall University – Assistant Chairman (Chemistry)
1980 – 1981	University of Southern California – Research Professor
1986 – 1988	Seton Hall University – Chairman (Chemistry)
1988 –1989	Emory University – Research Professor
1993 – 1996	Seton Hall University – Associate Dean, Arts & Science
1996 – 1998	Seton Hall University – Chairman (Chemistry)
Spring 1999 & 2000	Florida Atlantic University – Visiting Professor
Fall 2001-Spring 2002	Florida Atlantic University – Visiting Professor
Fall 2002 - present	Florida Atlantic University – Professor

TEACHING/RESEARCH HONORS & AWARDS

1977 – 1978	University Achievement Award (Research)
1985 – 1994	Merit Awards for Teaching & Research
May 1992	Seton Hall University – "Teacher of the Year"
May 1966	ACS (North Jersey) "Excellence in Education Award"
May 1966	Seton Hall University – Premedical Honor Society "Second Annual Students' Choice Award"
October 1996	Seton Hall University – Achievement in Teaching Award

PROFESSIONAL ACTIVITIES

1966 – present	Member, American Chemical Society
1966 – present	Member, North Jersey Section, ACS
1985 – 1993	Chair of Meeting Arrangements Committee North Jersey Section, ACS
1987 – 1992	Chair of Inorganic Topical Group North Jersey Section, ACS
1989 – 1998	Councilor (or alternate) to National ACS North Jersey Section, A

UNIVERSITY ACTIVITIES (SELECTED)

Numerous Departmental Committees

1976	Dean's Committee on Faculty Incentives & Awards
1976 – 1980	Member, University Senate
1979 – 1980	College of Arts & Sciences Merit Award Committee
1976 – 1980	Faculty Survey & Elections Committee
1981 – 1983	University rank & Tenure Committee

1987 – 1988	Search Committee for Dean of Arts & Science
1992 – 1993	College of Arts & Science Rank & Tenure Committee
1998 – 2000	College of Arts & Science Rank & Tenure Committee
Fall 2002-present	Numerous Departmental Committees
Academic year 2012-2013	CESCOS NIT Promotion Committee
Academic year 2013-2014	CESCOS NIT Promotion Committee
Academic year 2014-2015	CESCOS NIT Promotion Committee

PUBLICATIONS & PRESENTATIONS (before 1995)
17 publications in American Chemical Society journals
10 publications in other major chemistry journals
30 papers presented at national and regional ACS meetings
Numerous seminars at other universities and companies

PUBLICATIONS & PRESENTATIONS

1. Calderone, D.M., Mantilla, E.J., Hicks, M., **Huchital, D.H.**, Murphy, Jr., W.R. & Sheardy, R.D. "Binding of Co(III) to a DNA Oligomer via Reaction of $[Co(NH_3)_5OH_2]^{3+}$ with $(5medC\text{-}dG)_4$. Biochemistry 34, 13841-13846 (1995)

2. Hicks, M., Wharton III, G., **Huchital, D.H.**, Murphy, Jr., W.R. & Sheardy, R.D., "Assessing the Sequence Specificity in the Binding of Co(III) to DNA via a Thermodynamic Approach." Biopolymers 42, 549-559 (1997)

3. Mantilla, E.J., Murta, D., **Huchital, D.H.**, Murphy, Jr., W.R. & Sheardy, R.D. "Binding Studies of Ruthenium(II) Ammines to Nucleic Acids" Biophysical Society Meeting, San Francisco, CA (1995)

4. Calderone, D.M., Hicks, M., **Huchital, D.H.**, Murphy, Jr., W.R. & Sheardy, R.D. "Sequence Specificity of $[Co(NH_3)_5OH_2]^{3+}$ Binding to DNA" American Chemical Society National Meeting, Chicago, IL (1995)

5. Villella, C.A., Karan Jr., C., Hicks, M., Sheardy, R.D., **Huchital, D.H.** & Murphy Jr., W.R. "Derivitization of Calf Thymus DNA with Cobalt(III) Ammine Complexes" American Chemical Society National Meeting, New Orleans (1996)

6. Sheardy, R.D., Hicks, M., Calderone, D.M., Villella, C.A., Murphy, Jr., W.R. & **Huchital, D.H.** "Further Investigations of the Sequence Specificity of Cobalt(III) Complexes with Self-Complementary DNA Oligonucleotides" American Chemical Society National Meeting, Orlando, FL (1996)

7. Mantilla, E.J., **Huchital, D.H.**, Murphy, Jr., W.R. & Sheardy, R.D. "Thermodynamics of the Binding of Ruthenium(II) Polypyridyl Bimetallic Complexes with Calf Thymus DNA" American Chemical Society National Meeting, Orlando, FL (1996)

8. Hicks, M., Sheardy, R.D., Wharton III, G., Pantano, T., Murphy, Jr., W.R. & **Huchital, D.H. "**Sequence Specificity in the Binding of Co(III) to DNA" Biophysical Society Meeting, New Orleans, LA (1997)

Salvatore D. Lepore (abbreviated CV)

A. Professional Preparation

Postdoc Fellow (2000), Eli Lilly and Company (with Michael R. Wiley), Indianapolis, IN

Ph.D. Chemistry (1997), Purdue University (with Merritt B. Andrus), West Lafayette, IN

B.S. Chemical Engineering cum laude (1992), University of South Florida, Tampa, FL

B. Appointments (at FAU)

Professor (2011 - present)

Associate Professor (2006 – 2011)

Assistant Professor (2000 – 2006)

C. Selected Peer-Reviewed Publications

(most significant five from the last 5 years)

Bhat, B. A.; Maki, S. L.; St.Germain, E. J.; Maity, P.; Lepore, S. D. Annulation Reactions of Allenyl Esters: an Approach to Bicyclic Diones and Medium-Sized Rings. *J. Org. Chem.* **2014**, *79*, 9402.

Al-huniti, M. H.; Lepore, S. D. Zinc(II) Catalyzed Conversion of Alkynes to Vinyl Triflates in the Presence of Silyl Triflates. *Org. Lett.* **2014**, *16*, 4154.

Mondal, D.; Li, S. L.; Bellucci, L.; Laino, T.; Tafi, A.; Guccione, S.; Lepore, S. D. Stereoretentive Chlorination of Cyclic Alcohols Catalyzed by Titanium (IV) Tetrachloride: Evidence for a Front-Side Attack Mechanism. *J. Org. Chem.* **2013**, *78*, 2118.

Maity, P.; Lepore, S.D. Catalytic synthesis of non-racemic azaproline derivatives via a kinetic-resolution based cyclization of β-alkynyl hydrazines. *Angew. Chem. Int. Ed.* **2011**, *50*, 8338.

Maity, P.; Lepore, S.D. Anion Catalyzed Addition of γ-Silylallenyl Esters to Aldehydes: A New Entry into [3.2.1] Bicyclic Natural Products *J. Am. Chem. Soc.* **2009**, *131*, 4196.

D. Selected Other Publications or Products/Grants

(most recent five from the last 7 years)

“Synthesis of a Bridged Bicyclic Natural Product Using Allenyl Esters” (4/14 – 3/17)
Agency: NIH (R15GM087932-01A1)
Direct Costs: $210,000 Indirect Costs: $101,320

"Elucidation of Reactions Mediated by Sulfidic Carbonate…" (1/12 - 8/14)
Agency: Amer. Chem. Soc. PRF (51785-ND2)
Direct Costs: $100,000 Indirect Costs: $0

“Total Synthesis of Garsubellin A" (9/13 - 9/14)
Agency: Indo-US Science and Technology Forum
Direct Costs: $38,000 Indirect Costs: $0 FAU Matching Funds: $8,000

“New Methods for the Expedited Synthesis of C11 and F18 PET Tracers” (4/10 – 1/13)
Agency: NIH (1R21MH087932-01A1)
Direct Costs: $450,000 Indirect Costs: $200,250

Patent: Lepore, S.D. Nucleophile Assisting Leaving Groups. US 8,822,707 B2 (Sep.2, 2014). Licensed by FAU to Sigma-Aldrich in 2010.

E. Synergistic Activities

Associate Editor - Perspectives in Medicinal Chemistry (Libertas Academica) open access journal. 2006 - Present

Grant Reviewer: Ad-Hoc NIH, SBC-A Study Section (Feb, 2014)

Scientific Advisory Board Member - CHS Pharma

Consultant for Akerman Senterfitt (law firm), ASE Pharmaceuticals, Florida Crystals, Sunol Biomolecular, Unison Pharmaceuticals, and Xcovery. 2003 – Present

Chemical Engineer – Delta Environmental Consultants (now Antea USA) Tampa, FL 1991 - 1993.

F. Collaborators and Other Affiliations

Victor W. Pike and Shuiyu Li, National Institute of Mental Health, PET Division, Bethesda, MA

Luca Bellucci and Andrea Tafi, Università degli Studi di Siena, I-53100 Siena, Italy

Teodoro Laino, IBM Zurich Research Laboratory, Rüeschlikon, Switzerland

Salvatore Guccione, Università degli Studi di Catania, Catania, Italy

G. Courses Taught

CHM 2200 - Introduction to Organic Chemistry (taught one semester, ~20 students); CHM 2210 - Organic Chemistry I (taught 10 semesters, ~ 350 students); CHM 2211 - Organic Chemistry II (taught 5 semesters, ~150 students); CHM 3060 - Chemical Literature (taught one semester, ~40 students); CHM 4220 - Organic Chemistry 3 (taught 9 semesters, ~ 15 students); CHM 6380 - Advanced Organic Chemistry (taught 4 semesters, ~ 15 students); CHM 6730 – Synthesis and Characterization (taught 13 semesters, ~15 students); CHM 5944 – Introduction to Chemical Research (taught 9 semesters, ~8 students)

H. Community Engagement or Out-reach

Heroes Class - invited to address middle school students in summer (2009) emphasizing the importance of scientific discoveries (such as the story of aspirin) in our daily lives; Invited lectures to FAU Life-Long Learning Center and to FAU charitable donors audience: “From Concept to Capsule: A Tour of the Prescription Drug Discovery Process” (2008/09)

Louda, J. William

A. Professional Preparation:
B.S. (1971-Wright State University)
M.S. (1978 -Florida Atlantic University)
Ph.D. (1993-South Florida University)

B. Appointments: Scientist Emeritus (FAU; 4/14 – present); Senior Scientist (FAU; 4/08-4/14); Associate Scientist (FAU - 1/03-4/08) Assistant Scientist (FAU- 7/99-1/03); Adjunct Professor / Research Associate / Senior Laboratory Specialist (FAU-1/78-7/99)

C. Selected Peer-Reviewed Publications:

Grant, C.S. and Louda, J.W. (2010) Microalgal pigment ratios in relation to light intensity– Implications for chemotaxonomy. *Aquatic Biology.* **11**: 127-138.

Khalesi (M.-R.)M. and Louda J.W., (2011), Hemisynthesis of 13^2,17^3-Cyclomesopheophorbide-a-enol. *Tetrahedron Letters*. **52**: 1078-1081

Louda, J. W., Mongkhonsri, P., and Baker, E.W. (2011) Chlorophyll degradation during senescence and death-III: Three to ten year experiments, implications for ETIO-series generation. *Org. Geochem.* **42**: 688-699

West, M. and Louda, J.W. (2011) Effect of external pH on cyanobacterial pigment expression. *Florida Scientist*. **74(2):** 181-186.

Szymczak-Żyła, M., Kowalewska, G. and Louda J.W. (2011) Sedimentary Chlorophyll-*a* derivatives as indicators of marine eutrophication. *Marine Chemistry* **125**: 39-48

Pisani O., Louda J.W. and Jaffe R. (2013) Biomarker assessment of spatial and temporal changes in the composition of flocculent material (floc) in a subtropical wetland. *Environmental Chemistry*. **10**: 424–436

Grant C. and Louda J.W. (2013) Scytonemin-imine, a mahogany-colored UV/VIS sunscreen of cyanobacteria exposed to intense solar radiation *Organic Geochemistry* **65**: 29-36.

D. Selected Other Publications or Products/Grants:

Moretzaei-Rad, M. and Louda, J. W. (2007) Polystyrene-Divinylbenzene (PS-DVB), a mild stationary phase for the chromatographic purification of the unstable 13^2, 17^3-cyclopheophorbide-a-enol. *J. Liquid Chromatogr. & Rel. Technol*. **30**: 1361-1369.

Szymczak-Żyła, M., Louda, J. W. and Kowalewska, G. (2008) Influence of microorganisms on chlorophyll-a degradation in the marine environment. *Limnol. Oceanogr.* **58**: 851-862.

Louda, J. W. (2008) Pigment-Based Chemotaxonomy of Florida Bay Phytoplankton; Development and Difficulties. *J. Liquid Chromatogr. & Rel.Tech.* **31**: 295-323.

Szymczak-Żyła, M., Louda, J. W. and Kowalewska, G. (2008) Comparison of extraction and HPLC methods for marine sedimentary chloropigment-*a* determinations. *J. Liquid Chromatogr. and Rel. Tech.* **31**, 1162-1180.

Louda, J.W., Neto, R.R., Magalhaes, A. R. M., and Schneider,V.F. (2008) Pigment alterations in the brown mussel *Perna perna*. *Comparative Biochemistry and Physiology* **–B 150**: 385 – 394.

Grant and contract continuous support from 1995 to March 31, 2014 from various agencies including; National Science Foundation, National Oceanographic and Atmospheric Administration, South Florida Water Management District and the Office of naval Research.

Grant writing activity and research to resume January 2015.

E. Synergistic Activities (Until March 31, 2014):

Oversaw departmental non-secretarial staff; Responsible for stockroom and teaching laboratory budgets. Direct supervisor for the Senior Laboratory Technician in the operation of the stockroom and lab sales. Responsible for Chemical Hygiene Plan implementation and the safe operation of all teaching and research laboratories.

Other duties included Property Accountability Officer, Public Liaison Officer, Space Planning, Building Officer, etc.

Committee service up to March 31, 2104 included six Departmental Committees, seven College Committees and four University Committees.

Submitted and obtained two 3 year Tech-Fee grants for six years support of Chem-Draw software and laboratory instrumentation upgrades.

Obtained J.W. Fulbright Specialist award for travel and research in Poland (2011).

Thirty-three Undergraduate student researchers (DIS, CHM-4905)

Fifteen Masters students graduated as advisor, six as co-advisor.

Two Ph.D. students graduated.

F. Collaborators and Other Affiliations:

Dr. Brian Lapointe (FAU-HBOI); Dr. Dave Phillip (Univ. Illinois); Mr. Aaron Shultz (Director Cape Eleuthera Institute, Bahamas); Dr. Scot Hagerthey (US-EPA Washington, D.C.); Drs. Graxyna Koawalewska and Malgorzata Szymczak-Żyła, Institute of Oceanology, Sopot, Poland); Dr. Renato Neto (Universidade Federal de Espirito Santo, Brazil); Drs. Yosef Yacobi and Ilya Ostrovsky (Kinneret Limnological Laboratory, Israel).

G. Courses Taught:

CHM-3080, Environmental Chemistry (Spr. 2004-present)
CHS-6611, Chemistry for Environmental Scientists (Fall 2000 -2013, Spr. 2015)
CHML-4139, Bioanalytical Laboratory (Spr. 2005-2014)
CHM-6157, Instrumentation (Fall 2011-2013)
CHM-2095, Chemistry for Engineers (Fall 2008)
CHM-2032 / -2032L, Chemistry for the Health Sciences (Spr.2009, Fall 2011-12)
CHM-2020, Chemistry in Modern Life (Spr & Sum 2002-2003)

H. Community Engagement or Out-reach:

* Worked with various home owners' association and local governmental agencies on the so-called "Acreage Cancer Cluster" phenomenon central western communities of Palm Beach County. (Role was to explain the trans-uranic isotope series and natural radiation in well water.).

* Organized and oversaw "Chemathon" for 10 years at FAU. This was an American Chemical Society backed event for chemical knowledge competition amongst local (4 counties) high schools.

* Participant in the College of Science “Science Olympiad” since its inception. Established and ran the Environmental Chemistry section.

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Frank Mari, Ph.D.	Professor of Chemistry and Biochemistry
eRA COMMONS USER NAME (credential, e.g., agency login) frankmari	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YY	FIELD OF STUDY
Universidad Simon Bolivar, Caracas, Venezuela	B.S.	1983	Chemistry
University of Massachusetts, Amherst	M.S.	1987	Polymer Science & Eng.
University of Massachusetts, Amherst	Ph.D.	1990	Chemistry
Univ. of Massachusetts Medical Ctr., Worcester	Postdoctoral	1990-1992	Pharmacology

A. Personal Statement

My group is dedicated to a multidisciplinary research program focusing on the isolation and characterization of peptides and proteins of marine origin. The topics covered in our endeavors range from peptide and protein structure to their functional characterization. More specifically, we have focused in the peptides and proteins found the venom of predatory marine gastropods belonging to the genus *Conus*, or cone snails. We started this project soon after my arrival at Florida, where I decided to use the local marine resources as lead for compounds of pharmaceutical interest. We have been extremely successful in procuring the natural products required for this project, as we have collect over 147 cone snails species. We disposed of state-of-the-art bioanalytical instrumentation that has allowed exploring in detail the molecular intricacies of these compounds. This is evident from our publication record, which includes the discovery of the γ-D-hydroxyvaline, a doubly posttranslationally modified amino acid, featured in a new class of conopeptides. This R03 application is to fund a small self-contained project that is an extension of our previous analysis of the effect of α-conotoxins in Dα7 nAChRs. This project will support on-going efforts in our lab to further development in vivo Drosophila-based electrophysiology assays that can provide an efficacious methods for the characterization of sample-limited natural products. The Drosophila-based project was funded by a R21 application and has produced several publications. We are poised to continue this exploration process. My track record includes the supervision of a total of 19 master's students, from whom twelve have completed their degrees and eight Ph.D. students. My current group is composed of 10 students (2 Ph.D., 3 M.S. and 5 undergraduates). Because the nature of my research, I have always been able to keep a significant group, and we have been able to succeed in attracting federal funding, which has included a R21 and three R15 NIH grants. Additionally, I have established intramural, national and international collaborations, which have been vital to the success or our projects. Part of it has been stimulated by memberships with several units such as the Center for Molecular Biology and Biotechnology, the Center of Excellence in Biomedical and Marine Biotechnology, the Department of Biomedical Sciences and the Ph.D. program in Integrated Biology. The multidisciplinary nature of my research project requires extensive cross-departmental research collaborations that include colleagues with expertise in marine sciences, molecular biology and neuroscience.

B. Positions and Honors

Positions and Employment:

University of Massachusetts, Amherst, NMR Facility Manager, Departments of Chemistry and Polymer Science & Engineering, 1987-1989

University of Massachusetts, Amherst, NMR Consultant, Department of Chemistry Food Science & Engineering, 1990

University of Massachusetts Medical Center, Worcester, Postdoctoral fellow (George Wright's Lab,) and NMR Facility Manager, 1990-1992.

Clark University, Department of Chemistry, NMR consultant, 1992.
University of Massachusetts Medical Center, Worcester, Instructor of Pharmacology, 1992-1993.
Florida Atlantic University, Assistant Professor, Chemistry & Biochemistry, 1993-1999.
Florida Atlantic University, Center for Molecular Biology and Biotechnology, Member, 1998-present.
Florida Atlantic University, Center of Excellence in Biomedical and Marine Biotechnology, Member.
Florida Atlantic University, Department of Biomedical Sciences, Associate Faculty and member of the Integrative Biology Ph.D. program, 1998-present
Cognetix, Inc. Salt Lake City, UT, Consultant, 2000
Florida Atlantic University, Associate Professor, Chemistry & Biochemistry, 1999-2008.
Florida Atlantic University, Professor, Chemistry & Biochemistry, 2008-present.

Relevant Professional Experience and Memberships
Member of Review Panel for the Academic Research Infrastructure Program, Division of Chemistry, NSF, 1995
Grant Proposal Reviewer (CIFP, MRI, CAA and CAREER), Divisions of Chemistry and Biology, National Science Foundation, 1996-1998, 2006.
Grant Proposal Reviewer (Interdisciplinary Research Consortium - X02), National Institute of Health, 2006.
Ad Hoc reviewer, 2009, 2011.
Editorial Board, *Prep. Biochem. & Biotech* 1998-2010.
Editorial Board, *Chem. Biol. & Drug Discov.* 2005-present.
Reviewer for several journals (~30 papers/year)
Director of Operations of the NMR/Proteomics Facility, Florida Atlantic University, 1994-2009.
Biochemistry Degree Coordinator, Florida Atlantic University, 1996-2009.
Biophysical Society, SfN, International Society for Toxinology, Member

Awards and Honors:
Diabetes Endocrinology Research Center, University of Massachusetts Medical Center, new pilot feasibility studies award, 1992.
National Institute of Health, training fellowship, University of Massachusetts Medical Center, 1992.
Researcher of the Year, 1996-1997**,** Florida Atlantic University**.**

C. Selected Peer-reviewed Publications
Heghinian MD, Mejia M, Adams DJ, Godenschwege TA, **Mari F**. Inhibition of Cholinergic Pathways in *Drosophila melanogaster* by α-Conotoxins. *The FASEB Journal*. 2014; In Press.
Safavi-Hemami H, Moller C, **Mari F**, Purcell AW. High molecular weight components of the injected venom of fish-hunting cone snails target the vascular system. *Journal of Proteomics*. 2013;91c:97-105. Epub 2013/07/23. PubMed PMID: 23872086.
Peigneur S, Van Der Haegen A, Moller C, Waelkens E, Diego-Garcia E, **Mari F**, Naude R, Tytgat J. Unraveling the peptidome of the South African cone snails *Conus pictus* and *Conus natalis*. *Peptides*. 2013;41:8-16. Epub 2012/07/11. PubMed PMID: 22776330.
Mourao CB, Heghinian MD, Barbosa EA, **Mari F**, Bloch C, Jr., Restano-Cassulini R, Possani LD, Schwartz EF. Characterization of a novel peptide toxin from *Acanthoscurria paulensis* spider venom: a distinct cysteine assignment to the HWTX-II family. *Biochemistry*. 2013;52(14):2440-52. Epub 2013/03/19. PubMed PMID: 23496776.
Moller C, Vanderweit N, Bubis J, **Mari F**. Comparative analysis of proteases in the injected and dissected venom of cone snail species. *Toxicon*. 2013;65:59-67. Epub 2013/01/24. PubMed PMID: 23339854; PubMed Central PMCID: PMCPmc3619401.
Mejia M, Heghinian MD, **Mari F**, Godenschwege TA. New tools for targeted disruption of cholinergic synaptic transmission in *Drosophila melanogaster*. *PloS one*. 2013;8(5):e64685. Epub 2013/06/06. PubMed PMID: 23737994; PubMed Central PMCID: PMCPmc3667824.
Peigneur S, Beress L, Moller C, **Mari F**, Forssmann WG, Tytgat J. A natural point mutation changes both target selectivity and mechanism of action of sea anemone toxins. *FASEB Journal*. 2012;26(12):5141-51. Epub 2012/09/14. PubMed PMID: 22972919.

Franco A, Kompella SN, Akondi KB, Melaun C, Daly NL, Luetje CW, Alewood PF, Craik DJ, Adams DJ, **Mari F**. RegIIA: an α4/7-conotoxin from the venom of *Conus regius* that potently blocks a3b4 nAChRs. *Biochemical Pharmacology*. 2012;83(3):419-26. Epub 2011/11/24. PubMed PMID: 22108175.
Rivera-Ortiz JA, Cano H, **Mari F**. Intraspecies variability and conopeptide profiling of the injected venom of *Conus ermineus*. *Peptides*. 2011;32(2):306-16. Epub 2010/12/04. PubMed PMID: 21126547; PubMed Central PMCID: PMCPmc3619394.
Moller C, **Mari F.** 9.3 KDa components of the injected venom of *Conus purpurascens* define a new five-disulfide conotoxin framework. *Biopolymers*. 2011;96(2):158-65. Epub 2010/06/22. PubMed PMID: 20564010; PubMed Central PMCID: PMCPmc3619398.
Moller C, Melaun C, Castillo C, Diaz ME, Renzelman CM, Estrada O, Kuch U, Lokey S, **Mari F**. Functional hypervariability and gene diversity of cardioactive neuropeptides. *The Journal of Biological Chemistry*. 2010;285(52):40673-80. Epub 2010/10/07. PubMed PMID: 20923766; PubMed Central PMCID: PMCPmc3003366.
Mejia M, Heghinian MD, Busch A, Armishaw CJ, **Mari F**, Godenschwege TA. A novel approach for in vivo screening of toxins using the Drosophila Giant Fiber circuit. *Toxicon*. 2010;56(8):1398-407. Epub 2010/08/21. PubMed PMID: 20723555; PubMed Central PMCID: PMCPmc2967628.
Moller C, **Mari F**. A vasopressin/oxytocin-related conopeptide with γ-carboxyglutamate at position 8. The *Biochemical Journal*. 2007;404(3):413-9. Epub 2007/03/03. PubMed PMID: 17331075; PubMed Central PMCID: PMCPmc1896288.
Pisarewicz K, Mora D, Pflueger FC, Fields GB, **Mari F**. Polypeptide chains containing D-γ-hydroxyvaline. *Journal of the American Chemical Society*. 2005;127(17):6207-15. Epub 2005/04/28. PubMed PMID: 15853325.
Moller C, Rahmankhah S, Lauer-Fields J, Bubis J, Fields GB, **Mari F**. A novel conotoxin framework with a helix-loop-helix (Cs α/α) fold. *Biochemistry*. 2005;44(49):15986-96. Epub 2005/12/08. PubMed PMID: 16331958.

D. Research Support

Ongoing Research Support

DP1093115 – Australian Research Council — 2/1/10 – 1/31/15 — Adams & Craik (PIs) Mari (Partner Investigator)

Defining mechanisms of action of novel α-conotoxins at nicotinic receptor channels
The major goals of this project are to functionally characterized novel α-conotoxins and evaluate their potential as therapeutic agents.

Seed Program – Florida Atlantic University — 5/1/14 – 4/30/15 — Mari & Hartmann (PIs)

Medicines from the Sea: Conotoxins as molecular probes and potential therapeutic modulators of the immune system
The major goals of this project are to evaluate the effects of conotoxins in immune cells line and assess their potential therapeutic value.

Completed Research Support

R21 NS066371 — 7/16/09 – 7/15/12 — Mari (PI)
Efficacious Screening of Peptidic Natural Products Using Drosophila

R15 GM080737 — 4/12/07 – 3/31/10 — Mari (PI)
Neuropharmacology of Conophans and Hydroxyconophans.
The goal of this project is to augment our current supply of conophans/γ-hydroxyconophans in order to carry out extensive biological assays geared towards the evaluation of these new compounds as potential as therapeutic agents.

R/LR-MB-28 - Florida Sea Grant /NOAA — 2/1/08 – 1/31/10 — Mari (PI)
Carboxylated Neuroprotective Agents from Cone Snails

The major goals of this project are to synthesize and carry out assays on a selected set of carboxylated conopeptides and evaluate their potential as neuroprotective agents.

BIOGRAPHICAL SKETCH
Evonne M. Rezler, Ph.D.

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Department of Chemistry and Biochemistry
777 Glades Rd, Boca Raton, FL 33431
PS 55, rm 110

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fax: (561) 297-2759
email: erezler@fau.edu

A. Professional Preparation

University of Sydney, Australia	Inorg. Chem.	B.Sc. (hons.)	1995
University of Sydney, Australia	Inorg. Chem.	Ph.D.	2001
University of Arizona	Biochem. postdoc.		2002-2003
Florida Atlantic University	Biochem. postdoc		2004-2006

B. Appointments

Florida Atlantic University	Director for Program Assessment, Charles E. Schmidt College of Science	2014-present
Florida Atlantic University	Associate Scientist	2014-present
Florida Atlantic University	Assistant Scientist	2007-2014
Florida Atlantic University	Visiting Instructor	2006-2007
Florida Atlantic University	Postdoctoral Fellow	2004-2006
University of Arizona	Postdoctoral Fellow	2002-2003

C. Selected Peer-Reviewed Publications

1. J. Ye, S.A. Fox, M. Cudic, **E.M. Rezler**, J.L. Lauer-Fields, G.B. Fields, A.C. Terentis "Determination of Penetratin Secondary Structure in Live Cells with Raman Microscopy" *J. Am. Chem. Soc.* 132, 980–988, **2010**.
2. D.R. Khan, **E.M. Rezler**, J. Lauer-Fields, G.B. Fields, "Effects of Drug Hydrophobicity on Liposomal Stability" *Chem. Biol. Drug Des.* 71, 3-7, **2008**.
3. Y. Qin, **E.M. Rezler**, V. Gokhale, D. Sun, L.H. Hurley, "Characterization of the G-quadruplexes in the duplex nuclease hypersensitive element of the PDGF-A promoter and modulation of PDGF-A promoter activity by TMPyP4" *Nucleic Acids Res.* 35(22), 7698-7713, **2007**.
4. **E.M. Rezler**, D.R. Khan, J. Lauer-Fields, M. Cudic, D. Baronas-Lowell, G.B. Fields, "Targeted drug delivery utilizing protein-like molecular architecture," *J. Am. Chem. Soc.* 129, 4961- 4972, **2007**.
5. **E.M. Rezler**, D.R. Khan, R. Tu, M. Tirrell, G.B. Fields, "Peptide-Mediated Targeting of Liposomes to Tumor Cells", *Methods Mol. Biol.* 386, 269-298, **2007**.

D. Selected Other Publications or Products/Grants

External Funding:

Vertical Integration of Raman Spectroscopy into the Chemistry Curriculum", EM Rezler (PI), AC Terentis (Co-PI), JE Haky (Co-PI) National Science Foundation (NSF)*Transforming Undergraduate Education in Science (TUES) (Phase I)*
($199,804) in progress (2013-2016)

E. *Synergistic Activities*

1. NSF IUSE (Improving Undergraduate STEM Education) grant proposal reviewer and *ad hoc* NSF grant proposal reviewer (since 2014).
2. Journal article reviewer for Journal of Medicinal Chemistry (since 2004).
3. Undergraduate chemistry major student advisor (since 2009).
4. FAU Faculty Learning Community (FLC) co-leader, 2010-2011, FLC title: *Application of Problem Based Learning and Case Based Reasoning to Undergraduate Education*. Presentation: "Incorporating Problem Based Learning into an Enriched Organic Chemistry I Course", Evonne M. Rezler, Deborah W. Louda, Jerome E. Haky, Donna M. Chamely-Wiik and Nancy Romance, *21st Biennial Conference on Chemical Education,* (BCCE), **2010**, University of North Texas, TX, USA.

5. Curricular for both the Organic Lab (CHML 2211) and Inorganic Lab (CHML 3609) courses were redeveloped at FAU and published in custom texts: “Experiments in Organic Chemistry”, E.M. Rezler Wiley, MA, **2010-2011**; “Experiments in Inorganic Chemistry”, E.M. Rezler and J.E. Haky, Wiley, MA, **2009-2010**. Novel assessment material that was developed for the Organic Chemistry Lab course was presented at: “Organic Laboratory Experiment Assessment Tool (OLEAT)”, Evonne M. Rezler, Jerome E. Haky and Jeffrey R. Galin, *The Southeastern Regional Meeting of the American Chemical Society* (SERMACS), **2011**, Richmond, VA, USA.

6. Curricular material was developed for a future honors Inorganic Chemistry Lab course at FAU, progress in this project was presented at a number of regional meetings: “An Investigative Approach to Coordination Chemistry”, Samantha L. Maki, Jerome E. Haky and Evonne M. Rezler, *42nd Annual Southeastern ACS Undergraduate Research Conference,* (SURC), **2010**, Kennesaw State University, GA, USA; *43rd Annual Southeastern ACS Undergraduate Research Conference,* (SURC), **2011**, Georgia Southeastern University, Statesboro GA, USA; *Florida Annual Meeting and Exposition* (FAME), **2011**, Innisbrook, FL, USA.

7. An authentic green and photochemistry focused research experience was developed and implemented as a Capstone experiment in the Organic Chemistry II Laboratory course (CHML 2211). The undergraduate student on this project, Ms. Donella Beckwith presented progress in this project national conferences and locally at FAU. This project was carried out in collaboration with Dr. Stephane Roche, Assistant Professor in the Department of Chemistry and Biochemistry at FAU and will likely lead to a publication of an article in the *Journal of Chemical Education*. Presentations: "Integration of a Novel Green Chemistry Experiment into the Organic Chemistry Lab at Florida Atlantic University" D. Beckwith, S.P. Roche, E.M. Rezler. **Poster presented** at the *43rd National Organic Chemistry Symposium*, June **2013**, Washington, OR, USA. "Integration of a novel Green Chemistry experiment, using a visible light photocatalyst, into the Organic Chemistry lab at Florida Atlantic University " D. Beckwith, S.P. Roche, E.M. Rezler. **Poster presented** at the *245th American Chemical Society National Conference*, April **2013**, New Orleans, LA, USA; and **Oral presentation** by D. Beckwith at the *Florida Atlantic University Undergraduate Research Symposium*, April **2013**, Boca Raton, FL, USA.

F. ***Collaborators and Other Affiliations***

Collaborators and Co-Editors: Drs. Gregg Fields and Torrey Pines Institute for Molecular Studies, FL; Drs. Robert Potter and Jeffery Raker at University of South Florida; Drs. Andrew Terentis, Jerome Haky, Mare Cudic, Deborah Louda, Nancy Romance, Stephane Roche, Salvatore Lepore and Jeffery Galin at Florida Atlantic University.

Graduate Advisors and Postdoctoral Sponsors: Prof. Trevor Hambley, University of Sydney (Ph.D. thesis advisor); Prof. Laurence Hurley, University of Arizona (postdoctoral advisor); Prof. Gregg Fields, Torrey Pines Institute for Molecular Studies, FL (postdoctoral advisor).

Graduate Student and Postdoctoral Advisees:

Satu Hyvarinen (M.S., in progress, co-advised with Drs. Haky and Terentis)

Undergraduate Student Advisees:

A total of twenty undergraduate researchers have been advised while at FAU. Ten undergraduate student advisees received the *FAU Undergraduate Research Grant.*

G. Courses Taught

General Chemistry II Lab (CHML 2046) course for Chemistry majors. Organic Chemistry II Lab (CHML 2211L), Organic Chemistry I Lecture (CHM 2210), Organic Chemistry II Lecture (CHM 2211), Inorganic Chemistry Lecture and Lab courses (CHM 3609 and CHML 3609). Also, CD Spectroscopy in CHM 4139 “Bioanalytical Instrumentation Lab”.

H. Community Engagement and Outreach

1. Florida Atlantic University (FAU) ACS Student Chapter and FAU Chemistry Club advisor (since 2008).

2. ACS Science coach 2011-2012, 2012-2013 and 2014-2015.

3. Member of Palm Beach County School District STEAM (Science, Technology, Engineering, Art, and Math) Advisory Board (since 2014).

4. Chair FAU AWIS (Association of Women in Science) Taskforce on Diversity (since 2014).

ABBREVIATED FACULTY CV
Stephane P. Roche

A. Professional Preparation

ACTIVITY/OCCUPATION	BEGINNING DATE (mm/yy)	ENDING DATE (mm/yy)	FIELD	INSTITUTION/ COMPANY	SUPERVISOR/ EMPLOYER
PhD	2002	2006	Organic Chemistry	University Blaise Pascal, France	**Prof. D. J. Aitken**
Postdoctoral Fellow	03/2006	03/2008	Organic Chemistry	ICES	**Prof. K. C. Nicolaou** (Singapore)
Postdoctoral Fellow	07/2008	09/2008	Organic Chemistry	University Blaise Pascal	**Dr. A. Gautier** (France)
Research Associate	10/2008	08/2011	Organic Chemistry	Boston University	**Prof. John A. Porco Jr.**

B. Appointments

Assistant Professor	**08/2011**	**present**	**Organic Chemistry**	**FAU**

C. Selected Peer-Reviewed Publications (most recent five from the last 7 years)

1. Jeedimalla, N.; Johns, J.; **Roche*, S. P.** *Tetrahedron Lett.* **2013**, *54*, 5845–5848. "Mechanistic Investigation and Implications of a Sacrificial Aniline for the Tandem Cascade Synthesis of 4-Aza-podophyllotoxin Analogues." *Ms. Jeedimalla is a first year graduate student and Ms. Johns was a master student that Dr. Roche mentored and directed through this first mechanistic and synthetic project aiming to produce a library of azapodophyllotoxin analogues for biological testing.*
2. Tr**é**guier, B.; **Roche*, S. P.** *Org. Lett.* **2014**, 16, 278–281 "A Double Annulative Cascade of Tryptophan Containing Peptides Triggered by Selectfluor®" *Dr. Tr**é**guier was a postdoctoral Fellow in the Roche Research Group at FAU*
3. **Roche*, S. P.**; Samanta, S. S.; Gosselin, M. M. J. ***Chem. Commun.*** **2014**, ***50***, 2632–2634 "Autocatalytic One Pot Orchestration for the Synthesis of α-Arylated α-Amino Esters.*" Mr. Samanta was a second year graduate student and Ms. Gosselin was an undergraduate student from France in internship at FAU.*
4. **Roche*, S. P.;** Youte Tendoung, J.-J.; Tr**é**guier, B.; *Tetrahedron* **2014**, *70*, DOI: 10.1016/j.tet.2014.06.054 http://www.sciencedirect.com/science/article/pii/S0040402014009144
5. Wasa, M.; Liu, R. Y.; **Roche*, S. P.; Jacobsen*, E. N.** *J. Am. Chem. Soc.* **2014**, *136,* 12872–12875 "*Asymmetric Mannich Synthesis of α-Amino Esters by Anion-Binding Catalysis"*

D. Selected Other Publications or Products (most recent five from the last 7 years)

6. Porco Jr., J. A.; Pelletier, J.; **Roche, S. P.**; Cencic, R.; Rodrigo, C. PCT Int. Appl. (**2011**), WO 2011140334 A2 20111110 ***Patent***
7. Lajkiewicz, N. J.; **Roche, S. P.**; Gerard, B., Porco Jr. *, J. A. *J. Am. Chem. Soc.*, **2012**, *134*, 13108–13113. "Enantioselective Photocycloaddition of 3-Hydroxyflavones: Total Syntheses and Absolute Configuration Assignments of (+)-Ponapensin and (+)-Elliptifoline". *Neil Lajkiewicz was a graduate student that Dr. Roche mentored (during his postdoctoral position in the Porco' Group) and directed through his first years of graduate school working on a photochemical project.*
8. Santagata, S.; Mendillo, M. L.; Tang, Y-C.; Perley, C. C.; **Roche, S. P.**; Kwon, H.; Koeva, M.; Subramanian, A.; Golub, T. R.; Amon, A.; Porco Jr., J. A.; Whitesell *, L; Lindquist *, S. *Science* **2013**, *341*, 250–260. "Tight coordination of protein translation and heat shock factor 1 activation supports the anabolic malignant state."

Poster Presentations at National Meetings

- "Integration of a novel Green Chemistry experiment, using a visible light photocatalyst, into the Organic Chemistry lab at Florida Atlantic University " D. Beckwith, **S. P. Roche, E. M. Rezler**. **Poster presented** at the *245th American Chemical Society National Conference*, April **2013**, New Orleans, LA, USA.
- "Integration of a Novel Green Chemistry Experiment into the Organic Chemistry Lab at Florida Atlantic University" D. Beckwith, **S. P. Roche**, **E. M. Rezler. Poster presented** at the *43rd National Organic Chemistry Symposium*, June **2013**, Washington, OR, USA.

E. Synergistic Activities

Chemical Biology; Mechanistic Investigations and Biosynthetic Pathway Elucidation

F. Collaborators and Other Affiliations

Network of collaborators for biological Testing:
Professor Pelletier at McGill University (Canada)
Professor Inglese, Director of NIH center NCATS
Dr. Ken Dawson-Skully at FAU (Co-PI of Ms. Tanya Kelley until 2014)
Dr. Dmitriy Minond at Torrey pines
Eli Lilly (Open Innovation Program)

Network of collaborators for Chemical Methodology and Mechanistic Investigations:
Professor Jacobsen, Chair of the Chemistry Department at Harvard University
Dr. Adam Alty, Director of R&D at Synquest (Florida)
Professor Terentis (FAU), starting a collaboration to synthesize tryptophan analogues as mechanism probes in the study of IDO.

Network of collaborators inside the Chemistry Department at FAU
Dr. Haces, on developing a library of azapodophyllotoxins for SAR studies.
Dr. Rezler, on developing a new lab experiment using visible-light photocatalysis.
Professor West, on studying biosynthetic pathways of briareolate esters natural products.

G. Courses Taught

FALL 2011: CHM 6157 – Instrumentation- Part of the course on NMR spectroscopy.***SPRING 2012:*** CHM 6225 – Advanced Organic Chemistry ***FALL 2012:*** CHM 2210 – Organic Chemistry I***SPRING 2013:*** CHM 6935 – Graduate Seminars ***SUMMER 2013:*** CHM 2210 – Organic Chemistry I ***FALL 2013:*** CHM 2210 – Organic Chemistry I; CHM 6935 – Graduate Seminars ***SPRING 2014:*** CHM 6380 – Topics in Stereochemistry; CHM 6935 – Graduate Seminars ***SUMMER 2014:*** CHM 2210 – Organic Chemistry I

Abbreviated Vita
Professor Patricia A. Snyder

Hired as Assistant Professor at Florida Atlantic University, Jan. 1976
Full Professor 1983-present
First Woman hired in tenure earning line in the Department of Chemistry

A1. Professional Preparation:
Ph.D. Degree: UCSD (University of California at San Diego, La Jolla, CA)
Major: **Physical Chemistry** Date Graduated: June, **1970**
Postdoctoral Appointment: Dept. of Biochemistry and Biophysics, Oregon State University, Corvallis, OR
Instructor: Department of Biochemistry and Biophysics, Oregon State University, Corvallis, Oregon

A2. Research Interests:
Physical Chemistry, Molecular Spectroscopy (Vacuum Ultraviolet Region), Absorption, Magnetic and Natural Circular Dichroism Spectroscopy, Electronic Structure of Molecules, Molecular Modeling
The electronic structure of molecules determines all of their chemistry. In principal, the electronic structure of molecules can be obtained by solving the Schrodinger equation: $H\Psi=E\Psi$
The problem is that no matter what quantum mechanical method is used to solve the Schrodinger equation approximations must be made. Experimentally determined electronic structure must be compared with quantum mechanical results to determine which approximations are best. The areas of particular interest are the "building block molecules" such as ethylene. It is important to determine the electronic structure of fundamental molecules such as ethylene and other simple olefins, which serve as the basis of understanding for the ubiquitous molecules with a carbon-carbon double bond.
To further investigate the electronic structure of molecules a unique new experimental capability was developed. The following publications give an introduction to this research.

a. "Ethylene, Experimental Evidence for New Assignments of Electronic Transitions in the $\pi \Rightarrow \pi^*$ Energy Region. Absorption and Magnetic Circular Dichroism Measurements with Synchrotron Radiation." Journal of the Physical Chemistry 108A, 4194 (2004).

b. "The First use of Synchrotron Radiation for Vacuum Ultraviolet Circular Dichroism Measurements." Nuclear Instruments and Methods 172, 345 (1980).

B. Appointments:
Sept. 1983 Professor of Chemistry: Department of Chemistry and Biochemistry, Florida Atlantic
To present University, Boca Raton, FL
Sept. 1983 to start Professor of Chemistry (graduate faculty): Department of Chemistry,
of FAU PhD program University of Florida, Gainesville, Florida PhD program
Sept. 1979 Associate Professor of Chemistry: Department of Chemistry, Florida
to Aug. 1983. Atlantic University, Boca Raton, Florida.
Sept. 1979 Associate Professor of Chemistry(graduate faculty): Department of Chemistry,
to Aug. 1983, University of Florida, Gainesville, Florida,
Jan. 1977 to Assistant Professor of Chemistry (graduate faculty): Department of Chemistry,
Aug. 1979 University of Florida, Gainesville, Florida 2

Jan. 1976 Assistant Professor of Chemistry: Department of Chemistry, Florida Atlantic University,
to Aug. 1979 Boca Raton, Florida.

C. Selected Peer-Reviewed Publications

Patricia Ann Snyder "A Practical Guide to Magnetic Circular Dichroism Spectroscopy." JACS (Journal of the American Chemical Society) 129, 14831-14832 (2007).

Patricia Ann Snyder, Clifford Sanders, Roger W.C. Hansen, "Experimental Evidence for the Assignment of Isobutene Electronic Transitions Using Vacuum Ultraviolet Absorption and Magnetic Circular Dichroism Measurements with Synchrotron Radiation. Comparison to Ethylene and Propylene." In preparation J. Physical Chemistry

Patricia Ann Snyder, Sylvia Atananosva, and Roger W. C. Hansen, "Ethylene. Experimental Evidence for New Assignments of Electronic Transitions in the π-π^* Energy Region. Absorption and Magnetic Circular Dichroism Measurements with Synchrotron Radiation", J. Physical Chemistry A**,** 108, 4194-4201 (2004).

D. Selected Products/Grants/presentations/Grant Review

Scientific Presentations: Ten presentations at Various Scientific Meetings in the last seven years

Grants /External Funds:

Invited to participate in a proposal (help write) to the National Synchrotron Light Source II (Brookhaven National Laboratory, Department of Energy) for a beamline to make natural and magnetic circular dichroism measurements using synchrotron radiation. 2010

National Science Foundation funds to attend Molecular Modeling meeting in Salt Lake City July 2014

External Funds to present an Invited Talk at American Chemical Society Meeting, May 2007

External Funds to Attend the Physical Chemistry on the Nanometer Scale Meeting [Funds via the American Chemical Society Petroleum Research Fund] July 27 thru August 3 2003

National Service:

Beamline Advisory Committee for National Synchrotron Light Source Brookhaven National Laboratory 2008.

Reviewer for National Granting Agencies, particularly for the National Science Foundation

E. Synergistic Activities

Advising and helping students with research, choosing graduate schools, finding employment, and writing grant proposals

G. Teaching Classes: I have been assigned, developed and taught service courses, BA courses, BS courses, and graduate courses for the department. I taught both undergraduate and graduate courses outside my area of expertise. The **courses in bold type** have been given in the last seven years.

Undergraduate Courses: Advanced Chemistry Laboratory, Biochemistry Laboratory, Biophysical Chemistry, **Physical Chemistry 1, Physical Chemistry 1 Laboratory, Physical Chemistry 2, Physical Chemistry 2 Laboratory, Independent Study, Introduction to Physical Chemistry, General Chemistry 1**, **Molecular Modeling**, Advanced Physical Chemistry (Quantum Chemistry), General Chemistry 2, Undergraduate Seminar, **General Chemistry for the Health Sciences, General Chemistry Laboratory for the Health Sciences**

Graduate Courses: Quantum Chemistry, Group Theory and Molecular Spectroscopy, Circular Dichroism Spectroscopy, Applications of Synchrotron Radiation, Physical Biochemistry, Topics in Chemistry, Kinetics, Molecular Modeling, Advanced Physical Chemistry, **Graduate Seminar**, Thermodynamics

ABBREVIATED FACULTY CV
Dr. Tito Sempertegui

A. Professional Preparation

Ph.D. Chemistry, Florida Atlantic University, May 2013
B.A. Liberal Arts and Science, Florida Atlantic University, May 2006

B. Appointments

Visiting Instructor, Florida Atlantic University, August 2014
Organic Chemistry Post-Doctoral Fellow, Florida Atlantic University, August 2013-August 2014

C. Selected Peer-Reviewed Publications

1. Mohammed Freewan, Martin Rees, Tito S. Sempertegui Plaza, Elias Glaros, Paul K. Witting, Andrew C. Terentis, and Shane R. Thomas "Human Indoleamine 2,3-Dioxygenase is a Catalyst of Physiological Heme Peroxidase reactions- Implications for the Inhibition of Dioxygenase Activity by Hydrogen Peroxide" *Journal of Biological Chemistry* **2013** 288:1548-1567

2. Andrew C. Terentis, Mohammed Freewan, Tito S. Sempertegui Plaza, Mark J. Raftery, Roland Stocker, and Shane R. Thomas "The Selenazal Drug Ebselen Potently Inhibits Indoleamine 2,3-Dioxygenase by Targeting Enzyme Cysteine Residues" *Biochemistry* **2010** *49* (3), 591-600

3. Tito S. Sempertegui Plaza, Tim Foo, Shane R. Thomas and Andrew C. Terentis. "Selenoorganic inactivators of Human Indoleamine 2,3-Dioxygenase". In preparation

4. Tito S. Sempertegui Plaza, Lisa Deacon, Jerome Haky, Evonne Rezler. "Enhancing Organic Chemistry I with web-based peer-led interactive modules and online homework". *In preparation*

D. Selected Other Publications or Products

1. 247th ACS National Meeting & Exposition, Dallas, TX, March 16-20th, **2014 (***Poster*)

2. 85th Annual Florida Meeting and Exposition (FAME 2009), Orlando, FL, May 14-16, **2009** (*Seminar, Biochemistry*)

E. Synergistic Activities

1. Web-OrgoBOND Project Development and enactment, Florida Atlantic University 2013-2014
2. Development of Physical Chemistry I experiment for NSF grant "Vertical integration of Raman spectroscopy into the Chemistry Curriculum" 2014

F. Collaborators and Other Affiliations

Drs. Evonne Rezler, Jerome Haky and Andrew Terentis

G. Courses Taught

Inorganic Chemistry, General Chemistry I, Organic Chemistry Lab

H. Community Engagement or Out-reach

1. Co-advisor FAU Chem Club 2014
2. Science Olympiad volunteer 2013
3. FAU College of Science Summer Science Institute 2013 and 2014, Organic Chemistry experiment instructor

BIOGRAPHICAL SKETCH
Andrew C. Terentis, Ph.D.

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PS 55, rm 110

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email: terentis@fau.edu

C. Professional Preparation

University of Sydney, Australia	Phys. Chem.	B.Sc. (hons.)	1992
University of Sydney	Phys. Chem.	Ph.D.	1997
Heart Research Institute, Sydney	Biochem.	postdoc.	1997-2001
University of Arizona	Biophys.	postdoc	2001-2003

D. Appointments

Florida Atlantic University	Associate Professor	2010-present
Florida Atlantic University	Assistant Professor	2004-2010
University of Arizona	Postdoctoral Fellow	2001-2003
Heart Research Institute, Sydney	Postdoctoral Fellow	1997-2001

C. Selected Publications

SA Fox, A Shanblatt, H Beckman, J Strasswimmer, AC Terentis (2014) Raman Spectroscopy Differentiates Squamous Cell Carcinoma (SCC) From Normal Skin Following Treatment with a High-Powered CO_2 Laser, *Laser Surg Med*, in press.

AC Terentis, J Ye (2013) Peptide detection and structure determination in live cells using confocal Raman microscopy, *Methods Mol Biol* 1081, 211-236.

AC Terentis, SA Fox, SJ Friedman, ES Spencer (2013) Confocal Raman micro-spectroscopy discriminates live human metastatic melanoma and skin fibroblast cells, *J Raman Spectrosc* 44, 1205-1216.

M Freewan, M Rees, TS Sempértegui Plaza, E Glaros, YJ Lim, X-S Wang, AWS Yeung, PK Witting, AC Terentis, SR Thomas (2013) Human Indoleamine 2,3-Dioxygenase is a Catalyst of Physiological Heme Peroxidase Reactions – Implications for the Inhibition of Dioxygenase Activity by Hydrogen Peroxide, *J Biol Chem* 288, 1548-1567.

AC Terentis, M Freewan, TS Sempértegui Plaza, M Raftery, R Stocker, SR Thomas (2010) The Selenazal Drug Ebselen Potently Inhibits Indoleamine 2,3-Dioxygenase by Targeting Enzyme Cysteine Residues, *Biochemistry* 49, 591-600.

J Ye, SA Fox, M Cudic, EM Rezler, JL Lauer, GB Fields, AC Terentis (2010) Determination of Penetratin Secondary Structure in Live Cells with Raman Microscopy, *J Am Chem Soc* 132, 980-988.

D. Selected Grants Received

National Science Foundation DUE-TUES type 1 Grant, "Vertical Integration of Raman Spectroscopy into the Chemistry Curriculum", E Rezler (PI), AC Terentis (co-PI), J Haky (co-PI), grant # DUE-1244807, 02/2013 – 01/2016, $199,803 total ($26,520 indirect costs)

FAU College of Science Faculty Research Seed Grant, "Role of soluble JAM-C in promoting pro-metastatic changes in breast cancer cells", AC Terentis (PI) and E Wojcikiewicz (co-PI), 06/2014 – 05/2015, $5,000

The Sinai Medical Staff Foundation, "Feasibility of Raman Spectroscopy for Concurrent Tissue Diagnosis and Guidance of Laser Ablative Surgery", AC Terentis (PI), 09/2008 – 08/2010, $67,693 total ($21,200 indirect costs)

American Chemical Society – Petroleum Research Fund Type G grant, "Structure-Function Studies of Indoleamine 2,3-Dioxygenase (IDO)", AC Terentis (PI), grant # 46549-G4, 06/2007 – 08/2010, $40,000 total

National Institutes of Health SCORE grant, "Probing porphyrin-DNA binding in cells: Raman microscopy", AC Terentis (PI), grant # S06-GM073621, 06/2005 - 05/2009, $281,000 total ($81,000 indirect costs)

E. Synergistic Activities

Chair, Department of Chemistry and Biochemistry Graduate Committee; Member, College of Science Graduate Committee; Proposal reviewer for NSF, American Chemical Society PRF, Australian National Health and Medical Research Council, Medical Research Council (U.K.); Journal article reviewer for Journal of Biological Chemistry, Journal of Physical Chemistry, Archives of Biochemistry and Biophysics

F. Collaborators and Other Affiliations

Collaborators and Co-Editors: Predrag Cudic, Torrey Pines Institute for Molecular Studies; Deguo Du, FAU; Gregg Fields, Torrey Pines Institute for Molecular Studies; Salvatore Lepore, FAU; John Strasswimmer, Lynn Cancer Institute, Boca Raton; Shane Thomas, University of New South Wales; Xiaotang Wang, Florida International University; Paul Witting, University of Sydney; Ewa Wojcikiewicz, FAU.

Graduate Student and Postdoctoral Advisees: Patrick Cosme, Timothy Foo, Sara Fox (graduated), Samantha Friedman, Tito Sempertegui (graduated), Jing Ye (graduated).

G. Courses Taught (last five years)

CHM3410 Physical Chemistry 1 (3 credit, every fall), CHM3410L Physical Chemistry 1 Lab (2 credit x 2 sections, every fall), CHM3411 Physical Chemistry 2 (3 credit, every spring), CHM3411L Physical Chemistry 2 Lab (2 credit, every spring), CHM6157 Instrumentation (3 credit, co-taught, fall, biannually)

CURRICULUM VITAE

Dr. Lyndon M. West
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Florida Atlantic University
Department of Chemistry & Biochemistry
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Fax: (561) 297-2759
E-mail: lwest@fau.edu
Webpage: http://westnatprodgroup.wordpress.com/dr-lyndon-west/

a. Employment

2009- Assistant Professor, Department of Chemistry and Biochemistry, Florida Atlantic University, Boca Raton Florida.
2006-2008 Assistant Professor, Department of Pharmaceutical and Biomedical Sciences, University of Georgia, Athens.
2004-2005 Research Assistant Professor, Florida Atlantic University, Florida.
2003-2004: Senior Scientist, Sequoia Sciences, San Diego, California.
2001-2003: Postdoctoral Research Chemist, Scripps Institution of Oceanography (Dr. D. John Faulkner).
1997-98: Teaching Assistant (Physical Science), School of Chemical and Physical Sciences, Victoria University, Wellington.

b. Education

1997-2001: Ph.D. in Organic Chemistry, Victoria University of Wellington, New Zealand. (Supervisor Dr P. T. Northcote)
Thesis Title: Isolation of Biologically Active Secondary Metabolites from New Zealand Marine Sponges.
1996 Dec: B.Sc. Hons. in Chemistry, Victoria University Wellington, New Zealand. (Supervisor Dr P. T. Northcote)Project Report: Analysis of Pateamine in the New Zealand Marine Sponge Mycale sp.
1993-1995: B.Sc. in Chemistry, Victoria University of Wellington, New Zealand.

c. Postdoctoral Experience

2001-2003: Postdoctoral Research Chemist at SCRIPPS Institution of Oceanography (Dr. D. John Faulkner)

d. Courses Taught at FAU and a Brief Course Description

CHM 2211: Organic Chemistry II, Fall 2010, Spring, Fall 2011, Spring 2012 (Instructor)
A more advanced study of different types of organic (carbon-based) compounds, their nomenclature, structure, identification, chemical behavior and reaction mechanisms. This course builds directly on material from Organic I Chemistry.
CHM 4139L: Bioanalytical Instrumentation Laboratory Spring, 2011, Spring 2012 (CoInstructor)
Introduction to instrumental analysis. The objective of this course is to get a basic understanding of quantitative instrumental analysis that involves electromagnetic radiation, spectroscopy, mass spectrometry, electrochemistry, and chromatography.
CHM 2210: Organic Chemistry I, Spring 2010 (Instructor)
This course introduces students with a description of different types of organic (carbon-based) compounds, their nomenclature, structure, identification, chemical behavior, reactivity and reaction mechanisms.
CHM 6157: Instrumentation, Fall 2009 (Co-Instructor)
By the end of this course, students should be able to understand the operation and theory of most of the instrumental methods currently used in our department's research projects and how to apply such methods to solve complex chemical and biochemical problems.
CHM 6730, Synthesis and Characterization, Spring 2009 (Co-Instructor)

Methods used by chemists to structurally characterize small organic molecules will be discussed. Emphasis will be placed on modern MS and NMR methods (1H- and 13C-NMR, DEPT, COSY, NOESY, HMBC, HMQC). The material will be presented using a standard lecture format as well as problem solving sessions in small groups.

e. Scholarly Activities- Summary of Research Areas, Publications, Abstracts, Presentations at Scientific Meetings, Other Scholarly/Professional Contributions

Summary of Research Area

My research at FAU focuses on the isolation and structural elucidation of biologically active natural products from marine organisms, in addition to the development of new methodology for natural products chemistry to accelerate the discovery of drug leads.

Journal Publications

• Duckworth, A. R.; West, L. M.; Vansach, T.; Stubler, A.; Hardt, M. Effects of water temperature and pH on growth and metabolite biosynthesis of coral reef sponges Mar. Ecol. Prog. Ser. 2012, 462, 67-77.

• Meginley, R. J.; Gupta P.; Schulz T. C.; McLean, A. B.; Robins, A. J.; West L. M. Briareolate Esters from the Gorgonian Briareum asbestinum." Marine Drugs 2012, 10, 1662-1670.

• Gupta P.; Sharma, U. West, L. M. Bicyclic C21 Terpenoids from the Marine Sponge Clathria compressa. J. Nat. Prod. 2012, 75 (6), 1223-1227.

• Gupta, P.; Sharma, U.; Schulz, T. C.; Sherrer, E. S.; McLean, A. B.; Robins, A. J.; West, L. M. Diterpenoid Containing a Reversible "Spring-Loaded" (E,Z)-Dieneone Michael Acceptor Organic Letters 2011, 13 (15), 3920-3923.

• Zheng, B.; West, L. M. Estimating the Lipophilicity of Natural Products using a Polymeric Reversed Phase HPLC Method. J. Liq. Chromatogr. Related Technol. 2010, 33, 118-132.

• Singh, A. J.; Xu, C.-X.; Xu, X.; West, L. M.; Wilmes, A.; Chan, A.; Hamel, E.; Miller, J. H.; Northcote, P. T.; Ghosh, A. K., Peloruside B, A Potent Antitumor Macrolide from the New Zealand Marine Sponge Mycale hentscheli: Isolation, Structure, Total Synthesis, and Bioactivity. J. Org. Chem, 2010, 75, (1), 2-10.

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