

# DEPARTMENT OF CHEMISTRY

## Budget Planning Document for FY16

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## 1. FY 15 Narrative

The Department of Chemistry had another productive year. Enrollments in the Chemistry major held fairly steady and the new Biochemistry major is growing. Major curricular changes continue, with the final revisions of the Chemistry major beginning in fall 2014 and the Biochemistry degree program freshly started in fall 2013. Faculty published 30 articles, most with student coauthors, and gave over 40 conference talks. Enhancements in instructional spaces and development of existing personnel have continued to improve the nature of the Department. The Department is on a positive trajectory that will bring it to even higher levels of productivity in teaching, scholarly activity, and service.

To continue this trajectory, critical resources are necessary. Although chemistry is an expensive discipline, it is central to many other fields, and so the entire University benefits from a healthy Department of Chemistry. This document details our accomplishments in FY 15 and the investments needed for continued success in FY 16.

### 1.1. Accomplishments and Productivity

#### 1.1.a. FY 15 Goals

In FY15, the major goals were to (A) focus on improving infrastructure supporting the educational mission of the Department, (B) reexamine the general chemistry program and the student support system, and to evaluate whether student needs are being effectively met, (C) find operational and organizational efficiencies to maximize the time faculty members can focus on their teaching and research efforts, and (D) make modest investments to insure that the teaching and research laboratories operate safely and that our vast inventory of chemicals is secure. The following specific objectives were identified for FY 15:

1. Focus on improving the student support infrastructure
2. Increase available research space
3. Devise a rational plan for recapitalizing teaching laboratory instrumentation
4. Provide instrumentation for new laboratory courses
5. Secure the Chemistry Stockroom
6. Increase support for MS students
7. Examine General Chemistry program
8. Enhance support for teaching and research instrumentation
9. Examine alternative instructional methods, particularly in Chemical Education
10. Examine the possibility of study abroad programs

Each of these goals and objectives arose from the overall mission of the Department of Chemistry. This mission aligns with several goals of *Educating Illinois*.

***Educating Illinois Goal 1. Provide a supportive and student-centered educational experience for high-achieving, diverse, and motivated students that promotes their success.***

The aim of each of the objectives is to improve and enhance the student experience. This is to be done directly through student support (Objectives 1 and 6) or through enhancements to the learning

environment that promotes a student-centered experience (Objectives 2, 3, 4, 6, 8, 9, and 10). Each of these objectives target the strategies for Goal 1: they will help to attract and retain high-achieving, diverse, and motivated students; increase opportunities for students to engage in high-quality, high-impact educational experiences; and provide integrated and holistic services that support students' individual needs. Objectives 7 and 9 address the strategy in which Departments can identify steps that can be taken to shorten time to degree.

***Educating Illinois Goal 2. Provide rigorous, innovative, and high-impact undergraduate and graduate programs that prepare students to excel in a globally competitive, culturally diverse, and changing environment.***

To be competitive in the global, diverse, and changing environment, students must have access to the same resources that they will encounter after earning their degree. The quality of the education provided in Chemistry relies on several factors, including physical infrastructure (Objectives 1, 3, 4, 5, and 8), student opportunities (Objectives 1, 3, and 6), and up-to-date curricula (Objectives 4, 7, 9, and 10).

***Educating Illinois Goal 3. Foster an engaged community and enhance the University's outreach and partnerships both internally and externally.***

Building student support (Objective 1) will build relationships with students in the program through academic and career advising and thus, as the students graduate, build better relations with alumni. The program coordinator requested in support of Objective 1 will pay great dividends in the Department's efforts to engage in external partnerships. We currently have extensive outreach efforts (Children's Discovery Museum, State Farm Millennial Girls Project, ProjectSEED, Expanding Your Horizons, Illinois State Fair Project, Chemistry Olympiad, to name just a few), that are poorly coordinated because they are all done on an ad hoc basis by faculty. These activities, along with our current and past corporate partnerships (ADM, Gillette, AOCs, Abbott), directly address Goal 3. Development of online materials (Objective 9) will help with outreach workshops such as for the Army National Guard Civil Support Teams we have previously conducted. Even the facilities enhancements (Objectives 2, 5, 6, and 8) will build pride and allegiance to the University as the program will make a better impression on current students, visiting alumni, and external visitors. In a contrary manner, the stockroom security improvement (Objective 5) will build community pride and allegiance by averting potential publicity and liability disasters if university materials were to be used for nefarious purposes or improper storage of chemicals resulted in injury.

***Educating Illinois Goal 4. Enhance institutional effectiveness by strengthening the organizational operation and enhancing resource development.***

We are committed to improving the Department's effectiveness through improvements in processes, procedures, and procuring external resources. The rational development of the Department's infrastructure as described in this document will greatly enhance the faculty's competitiveness for external funding. Each objective is aimed at making the Department of Chemistry more accountable and fiscally responsible. The student support infrastructure (Objective 1) will provide the students better return on investment through more effective advising (shorter time to degree) and better career

advisement (improved career placement). Investments in infrastructure (Objectives 2, 5, 6, and 8) and support (Objective 6) will result in increased productivity. Improving the General Chemistry program (Objective 7) and implementing the new laboratory courses (Objective 3) will ensure that students have the best educational experiences in Chemistry.

The Department of Chemistry's objectives also closely align with the *CAS Strategic Plan 2010-2015*:

***CAS Strategic Focus 1. Facilitate Academic Excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Increase available research space (Objective 2)
- Devise a rational plan for recapitalizing teaching laboratory instrumentation (Objective 3)
- Provide instrumentation for new laboratory courses (Objective 4)
- Increase support for MS students (Objective 6)
- Examine the General Chemistry Program (Objective 7)
- Enhance support for teaching and research instrumentation (Objective 8)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 9)
- Examine the possibility of study abroad (Objective 10)

***CAS Strategic Focus 2. Enhance the systems and infrastructure supporting academic excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Increase available research space (Objective 2)
- Devise a rational plan for recapitalizing teaching laboratory instrumentation (Objective 3)
- Provide instrumentation for new laboratory courses (Objective 4)
- Secure the Chemistry Stockroom (Objective 5)
- Enhance support for teaching and research instrumentation (Objective 8)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 9)

***CAS Strategic Focus 3. Diversify and enhance financial support for academic excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Devise a rational plan for recapitalizing teaching laboratory instrumentation (Objective 3)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 9)

***CAS Strategic Focus 4. Share and promote our academic excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Examine the General Chemistry Program (Objective 7)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 9)
- Examine the possibility of study abroad (Objective 10)

### 1.1.b. Major Accomplishments

Specific accomplishments for each objective are enumerated below.

#### 1. Focus on improving the student support infrastructure in the Department

Students are the focus of all of our activities; essentially all of the accomplishments listed in this document are directed toward building student support. Replacing and upgrading laboratory equipment and facilities, modernization of classrooms and conference rooms, safety improvements, and curricular revisions (see below) are all examples of building student support.

However, we recognize that our direct student support is still inadequate, and that it will not substantially improve while the program coordinator position remains unfunded. Taking advantage of the personnel variance available this year, we have renewed our temporary full-time AP undergraduate advisor, Ally Chervenky. Since her hire in October 2013, she has made a profound impact on morale among students (and faculty) and has allowed faculty to focus on their teaching and research. By being able to dedicate her time solely to students, Ally has met with every student in the Department and worked with faculty on recruiting and retention efforts. We have also hired a webmaster on a part-time basis (through FCR funding). Career advising/placement, external relations, and recruiting still remain as areas of significant need, but the initial data based on having a staff position indicate that a solution through appropriate *permanent* staffing is possible. This position will only be more critical as the number of new Biochemistry majors increases.

#### 2. Increase available research space

As the proportion of research-active faculty increases, we are facing a critical shortage of research space. All options (including lab sharing, consolidation, and repurposing space) have been explored and several laboratory swaps, renovations and repurposing of space have been done in the past three fiscal years, including FY15. Clearly the lack of space is starting to negatively impact scholarly activity, though. We continue to create some efficiency for new research instruments, utilize teaching space for research during semester breaks, and put faculty members in spaces that better suit their needs, but clearly the lack of space will negatively impact scholarly activity, especially for a new hire.

#### 3. Devise a rational plan for recapitalizing teaching laboratory instrumentation

- Between mid-February of 2014 and late-January of 2015 the following major pieces of equipment were acquired to support teaching and research (\* denotes primary use is in teaching):

***Department and College Funds (\$96,513.24)***

- \*Small Equipment and Glassware for New Undergraduate Laboratory Courses – CHE373, 251, 351 (\$2,086.62)
- \*Hydrogenator reactor (\$16,710.98, Department Equipment Funds)

- Autosampler for Nuclear Magnetic Resonance Spectrometer (\$19,950; Department Equipment Funds and Materials Fees)
- \*Assorted small equipment and replacement modules (\$16,631; Department Equipment Funds and Startup, CAS)
- Tube Furnace (\$33,731, Startup)
- \*Vacuum pumps, balance, and pH meter (\$7,403.64; Materials Fees)
- As of February, 2015, plans exist to expend ~\$60,000 during the remainder of FY15 to acquire instrumentation for several teaching laboratories. Three modest equipment purchases are intended, which will serve our analytical, biochemistry, and organic laboratories. The purchases will come from a combination of materials fees and Department Equipment funds.
- Support for instrumentation for use teaching continues to be included in grant proposals.

#### **4. Provide Instrumentation for New Labs**

Following up on purchases using Provost Enhancement funds in FY14 and some departmental funds, small equipment and glassware have been purchased in FY15 to outfit the new Physical Biochemistry Lab (CHE 373), which will be offered in fall 2015. (\$4,455; Departmental funds, CAS) More modest funds have also been invested in materials for Inorganic Laboratory I (CHE251), which was offered for the first time in spring 2013 and has become more stable in the requirements, and sustainable from student fees. Some additional materials were necessary for the new iteration of Inorganic Laboratory II (CHE351) offered for the first time in fall 2014, but expenses were very modest as no laboratories required new instrumentation. These laboratories now appear to be outfitted for the near term.

#### **5. Secure the Chemistry Stockroom**

Two sources of funding were received in FY15 for the installation of a swipe card system in the Chemistry Stockroom. Chemistry was awarded a portion of a state grant pursued with Environmental Health & Safety and others for security to the University (\$17,000) and funds from CAS (\$12,000). We are slated to install five security doors, which was in excess of what we proposed as a minimum need. Infrastructure work has already begun with telecommunications and current estimates call for work to be complete by mid-March.

#### **6. Grow support for MS students**

- Eighteen competitive, \$1275 or \$1350 stipends were provided to graduate students to support research in the summer of 2014. Recipients were required to submit a summary of the work accomplished while supported. These stipends were made possible through internal reallocations.
- The Department has been successful in reducing the time to degree for M.S. students. This has resulted in some residual GTA funds in FY15. In future years we will be able to admit more students for a given level of funding.

**7. Examine General Chemistry program**

This item has been delayed due to other pressing issues, but continues to be an item for concern as our general chemistry instructors are actually diminishing with resignations and transitions to administration. Furthermore, we currently have an Interim Chair and such a long term discussion should wait for more permanent leadership. It is anticipated that a task force will be developed in FY16 to examine the entire general chemistry program, including our offerings in the general education program as we begin our self study for Program Review.

**8. Enhance support for teaching and research instrumentation**

In her fourth year as instrument technician, Cat McDonald has developed expertise in repairing the Department's scientific instruments. We continue to encourage her professional development and training. As a result of her preventive maintenance and her ability to make small repairs, the need for major repairs involving external service technicians was greatly reduced. However, we still lack sufficient fiscal support for purchasing service contracts at the level needed for a chemistry department with such extensive instrumentation holdings.

**9. Examine alternative instructional methods, particularly in Chemical Education**

In FY15, dozens more in-service teachers from across the nation have enrolled in a series of online courses, offered through the Full Cost Recovery model. These courses continue to raise the visibility of the Department to teachers and students across the nation; hundreds have participated over the years. Some progress in refining the online MCE and MSCE programs has been made in FY 15. Bob Quandt participated in the online DART project, and offered his atmospheric chemistry class in fall 2014 through the FCR model. We have plans to offer two other chemistry content classes in summer 2015, along with several chemical education classes we have been offering over the past few years. We continue to need a more stable model for instructors (currently ad hoc) and look to develop one going forward and eagerly await the addition of a Chemical Education faculty member for FY16.

**10. Examine the possibility of study abroad programs**

Limited progress has been made here, as it is item ten in an overly ambitious number of objectives for FY15. The Chair and Academic Advisor have met with and discussed possibilities with the International Office and participated in International Day and Study Abroad Fairs. We are currently examining our Plans of Study.

### 1.1.c. Accomplishments in Scholarly Productivity

Accomplishments in publications and presentations are summarized in the following table:

	No. with Undergraduate Students	No. with Graduate Students	No. with International Collaborators	Total
Journal Articles	7	21	7	30
Book Chapters	0	0	0	0
Regional/National Presentations	22	21	1	41
International Presentations	0	2	1	5

The following are some additional productivity measures, most for calendar year 2014

- Total Active Grants: \$1.66 million, \$1.26 million in research grants and \$399,981 in instrumentation grants.
- Number of editorial board members: 4
- Number of Public Presentations: 20
- Number of MS Theses supervised: 9
- Number of BS students engaged in research: 85
- Number of External Seminar Speakers: 12
- Number of Students Supported for Research-Related Travel: 15 (18 total in FY14)
- Funds allocated to support student-faculty research: Approximately \$13,800 in GR and \$52,000 in grant funds were used to support student-faculty research in FY15. (~\$13,800 GR, ~\$633,000 grants in FY14)
- Funds allocated to support co-curricular activities: Approximately \$5,000 in GR and Foundation funds in FY 14 were used to support co-curricular activities. (~\$6,800 in FY13)
- Types of co-curricular activities: Chemistry Club activities, external seminar speakers, homecoming tailgate, research poster session, and other social activities with students

### 1.1.d. Productivity Measures

#### TEACHING PRODUCTIVITY

Enrollments in Chemistry held steady in 2014, whereas we finally began enrollments in Biochemistry. As the Biochemistry and Molecular Biology program is nearly completely phased out and students must choose between a major in Biochemistry and a major in Molecular Biology, these numbers may change substantially over the next several years, but current trends indicate that it will be favorable for Chemistry.

<b>Table 1. Number of First Majors on Fall Semester Census Day</b>									
	<b>2014</b>	<b>2013</b>	<b>2012</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008</b>	<b>2007</b>	<b>2006</b>
Chemistry	120	126	120	122	148	144	153	153	162
Teacher Ed Seq.	26	27	28	42	56	44	49	46	49
Biochemistry	42	27	--	--	--	--	--	--	--
BMB	28	88	132	108	104	97	101	94	103
Biochemistry Seq.	11	17	44	39	16	--	--	--	--
Molec. Bio. Seq.	6	28	38	22	22	--	--	--	--
<b>Total Undergraduate</b>	<b>241</b>	<b>241</b>	<b>252</b>	<b>230</b>	<b>252</b>	<b>241</b>	<b>254</b>	<b>247</b>	<b>265</b>
Master of Science	26	32	34	36	35	34	39	42	49
Master of Chem. Ed.	2	0	0	2*	13†	--	--	--	--
M. S. in Chem. Ed.	2	0	1*	2*	8†	--	--	--	--
<b>Total Graduate</b>	<b>30</b>	<b>32</b>	<b>35</b>	<b>40</b>	<b>56</b>	<b>34</b>	<b>39</b>	<b>42</b>	<b>49</b>

\*First cohort graduated (mostly) in Summer 2011; no new cohort started

†Off-campus program, so only end-of-term totals are available.

The Department has continued its efforts to improve recruiting, including via the web site, production of new promotional materials, and increased outreach efforts to admitted students. Merit scholarship-eligible students have been targeted specifically. Alas, without access to the admission data, we cannot comment on how admission numbers in Chemistry relate to last year at this time.

Several curricular reform efforts are underway that affect both the graduate and undergraduate programs:

- The IBHE approved the B.S. in Biochemistry degree in fall 2012, and the School of Biological Sciences received approval for their B.S. in Molecular Biology degree in February, 2013, so students currently enrolled in the BMB program will be advised to change to the new programs. The switch is still in progress, with no incoming students being allowed to choose BMB as a major, but no current BMB majors being forced to switch out. As such, many of our current seniors remain BMB majors.
- The Department is currently reviewing a revision to the M.S. in Chemical Education (MSCE) and Master of Chemical Education (MCE) curriculum that allows for more flexibility in a capstone experience and the substitution of some TCH courses with Chemical Education courses. Upon

approval of these changes a second cohort is expected to begin. With the development of online courses, such a change may not be as necessary.

- The Department is completing the fourth year of the new B.S. in Chemistry curriculum. All new courses have been implemented except for CHE 372/373, which will begin in fall 2015

#### **SCHOLARSHIP**

The Department had another productive year in obtaining research grants. Active research grants total nearly \$1.7 million, with just over \$300,000 in research grants with start dates in 2014. Faculty continue to be active in submitting grants in support of both research and instrumentation and having success despite the current funding climate.

In 2014, faculty members published 30 journal articles and gave 41 conference presentations.

#### **SERVICE**

Faculty members remained active in professional service and service to the University, reviewing numerous papers and grant applications, and regularly serving on NSF review panels. They also serve on numerous Departmental, College, University, and external professional committees. A few recognitions and positions are worth special mention. Rick Nagorski (along with advisor Ally Cherveney and former faculty member David Cedeño) won an Impact Award from ISU. Gregory Ferrence serves as the Chair of the national American Chemical Society Committee on Ethics. He also serves on the Executive Committee of the ACS local section. Rick Nagorski chairs the College Council.

## ***1.2. Internal Reallocations and Reorganizations in FY 15***

### **1.2.a. Reallocations and Reorganizations**

Kate Edler was again hired as a part-time AP to maintain the Department's web page, and Sara McCubbins was hired as a part-time AP to assist with the online courses offered through the FCR funding mechanism. A temporary Academic Advisor, Ally Cherveney, was hired through variance dollars to assist the department with advising, recruiting, and outreach. Numerous NTT faculty were hired to fill gaps left by leaves.

### **1.2.b. Usage of Additional Funds**

- Summer Session Funding: Funds were used to support CHE 102, 140, 230, 231, 242, and 494.
- External Funding: Grant funds were used to support individual faculty research.
- Foundation Funds: Several scholarships, including the Shulman Scholarships, the Kurz Fellowship, and the Sedgwick Scholarship, were funded by donations to the Foundation. External speakers, candidates, and alumni guests were hosted using funds from the Foundation.
- Variance Dollars: Ally Cherveney was hired as an academic advisor and several NTT faculty were hired to cover medical, education, and sabbatical leaves as well as the classes vacated by the Interim Chair. Student Teacher Supervisors in Chicagoland were also hired. Some variance funds will be used to support the academic advisor for the next two fiscal years and to support

future start up packages. Additional variance money will be used to provide summer salary for the Associate Chair, stipends to encourage faculty to write instrumentation grants, and summer stipends for graduate students if sufficient funds remain.

- Tech Tuition Dollars: \$9,480 in tech tuition funds was used to purchase the annual subscription for ChemSW, the Department's online inventory management system.
- Startup Funds: \$120,749.11 in FY14 and \$32,558.69 in FY15 from CAS were used for the startup packages of the most recent faculty hires.
- Full Cost Recovery Courses: In FY 15 a total of 6 courses were offered through the FCR funding model. The total enrollment was 165 students, most of whom were in-service teachers who would otherwise not have enrolled in courses at Illinois State University. Student feedback about the program has been very positive, growing the stature of ISU Chemistry in the field of Chemical Education. Over the period of summer 2014 through Spring 2015 the courses generated over \$170,000 in tuition and fees, and paid the salaries of four part-time NTTs. The funds netted the Department over \$35,000, of which \$14,800 was used for support personnel, and the remainder will be used to support the program, purchasing equipment for the teaching and research labs. We also estimate that the program generated approximately \$19,000 for the Provost's Office in FY15.

### **1.3. Accountability Reports**

#### **1.3.a. Instructional Capacity Accountability Report.**

The Department of Chemistry received \$213,291.23 in Instructional Capacity and General Education funds. Details of the expenditures of these funds will be provided in the FY 2015 Instructional Capacity Accountability Report.

#### **1.3.b. Supplemental Travel for Field Supervision Accountability Report.**

The Department of Chemistry received \$2,000 in Supplemental Travel for Field Supervision. Details of the expenditures of these funds will be provided in the FY 2015 Supplemental Travel for Field Supervision Accountability Report.

#### **1.3.c. Provost Enhancement Accountability Report.**

Chemistry did not receive any Provost Enhancement funds for FY15.

#### **1.3.d. SBC Accountability Report.**

Chemistry used its SBC funds in FY15 for instructional and advising costs by hiring temporary AP/NTT personnel who have temporarily replaced faculty/staff on leaves/sabbaticals, as proposed.

## 2. FY 16 Planning Document

### 2.1. Major Objectives for FY 16

#### 2.1.a. Continuing Efforts

The Department prides itself in providing an undergraduate experience that combines the best qualities of a large research institution (i.e. access to state-of-the-art instrumentation and a research-active faculty) with those of a liberal arts institution (i.e. daily contact with faculty in class and laboratory). It is our aim to maintain our top-quality undergraduate program and continue to be a leader in teaching and research at the undergraduate and Master's level. Toward this end, the Department has several ongoing efforts that include:

- Promote collegiality among the faculty
- Strive for effective and engaging teaching at all levels
- Provide personal attention to students in the classroom and in the laboratory
- Maintain outstanding degree programs
- Periodically review and assess the curriculum
- Enhance technology in the classroom and in the laboratory
- Promote undergraduate research
- Facilitate strong scholarly and professional activities by the faculty and students
- Foster collaborations within and outside the department
- Encourage service to the University and to the profession

#### 2.1.b. Major Goals and Objectives

The Department's major goals for FY 16 are in line with those for prior fiscal years, *viz* (A) improve support for teaching laboratories, striving to acquire high-tech equipment and instrumentation similar to what graduates will encounter in the private sector and in graduate/professional school, (B) continue to find operational and organizational efficiencies that enable existing resources to be focused toward improving the student experience and ensuring their safety, (C) reexamine the general chemistry program and the student support system and evaluate whether student needs are being effectively met, and (D) begin long-range planning for future expansion of research and instructional space.

The following specific objectives are designed to support these broader goals for FY 16.

##### 1. Focus on improving the student support infrastructure

Recent hires, including temporary hires, and operational efficiencies have greatly improved the support of the Department's teaching and research missions, but there still exists a substantial lack of student support. Faculty members cover many essential student support functions on an ad hoc basis, to the detriment of their teaching and research (because of the quantity of time required) and to the detriment of the student (because the faculty member has competing priorities). If the Department is to continue its progress, it must hire a *permanent* program coordinator. This staff person, who ideally will have an advanced degree in chemistry, would

have duties in undergraduate academic and career advising, career placement, external relations, and student recruiting. While this position will greatly enhance faculty productivity, more importantly it will have an even greater impact on the student experience. The temporary hire of an academic advisor has aided greatly in this endeavor in FY15 based on the results we have seen so far since FY14, but that is a temporary solution. We feel that the timing is even more critical given the increasingly larger number of Biochemistry majors that will soon have a home in the Department of Chemistry.

## **2. Increase available research space**

As the proportion of research-active faculty increases, we are facing a critical shortage of research space. All options (including lab sharing, consolidation, and repurposing space) have been explored and some implemented, but clearly the lack of space is starting to negatively impact scholarly activity. Were it not for a recent resignation, we would have no space for the new hires we need to effectively operate our programs. Furthermore, an increasing number of faculty have chosen to remain research-active following retirement. As some of our most productive faculty are reaching retirement age, it will be even more important to the Department to continue to provide some space to emeritus faculty members. We must therefore continue the process of finding alternate research space on campus, and to make the case for a completion of the full footprint of the Science Laboratory Building.

## **3. Devise a rational plan for recapitalizing teaching laboratory instrumentation**

The science of Chemistry is heavily dependent on technology and instrumentation. The pace of instrument and technology development is continually accelerating, making it increasingly difficult to prepare students for employment and graduate school. We are striving to replace and upgrade instrumentation using any available resources. Unfortunately the combination of flat budgets, vanishing buying power, the high cost of modern instrumentation (\$20,000 to \$300,000+), and the shrinking pool of government funding conspire to make this goal ever more elusive. To remain competitive for students and grants and to ensure that our students are competitive in the workforce, we must solve this dilemma. Because a significant fraction of the instrumentation purchased when the SLB was opened in 1997 is still in use in our undergraduate teaching laboratories, it is imperative that new resources are obtained first to revitalize and then to sustain the laboratory facilities. University support for instrumentation has declined more than 50% (in real dollars) over the past 20 years despite a substantial increase in the number of research-active faculty and a nearly 50% increase in majors served by the Department. *Without continued substantial investment in the instrumentation infrastructure of the teaching laboratories the quality of the undergraduate program will decline.* The replacement of instrumentation will be a priority for the foreseeable future. We recognize that this must be done through a combination of grants (mostly for larger pieces of equipment, generally over \$100,000), student fees (for smaller pieces of equipment), and Department

funds. It is extraordinarily difficult to find funding for mid-range pieces of equipment (\$20,000 - \$100,000) that are to be used exclusively for teaching, and so alternative sources need to be identified. Progress is being made in this area, especially through the use of the SBC process for mid-range instruments, but improvement is still needed.

#### **4. Increase support for MS students**

Arguably the most immediate and cost-effective way to raise the Department's scholarly productivity is to increase the number of graduate students supported and to provide partial stipends for graduate student summer research. In Chemistry, summer is the most productive time for research; all research-active faculty maintain a laboratory presence during the summer regardless of their funding status. The M.S. students (in general) do not take courses during the summer, and so they are able to devote more time to their thesis research projects. Unfortunately, due to lack of financial support in the summer, many of the students must take outside jobs or leave the community. This severely reduces the number of hours they can spend in the research lab, negatively impacting productivity and time to degree. With even partial summer support, students will make more progress, thus increasing the productivity of their research advisor and the likelihood of obtaining grant funding. Similar gains could be made by increasing the number of assistantships during the academic year so that more students can be admitted into the program. We have been working with donors to endow summer scholarships for M.S. students, but nothing substantial has been finalized as of now.

#### **5. Examine General Chemistry Program**

The general chemistry program (including the General Education courses) has not been substantially revised for 10+ years. Enrollment pressures in CHE 102, 110, 140, and 141, combined with a perceived decline in the math skills of incoming students, despite rising ACT scores, have created substantial issues that must be considered when planning the Department's future courses in general chemistry. Even with Interim leadership, we must examine this issue soon to keep our retention rates high and lower our time to degree. Among the issues to be studied are:

- Are there any General Education-level courses that should be developed that have more relevance to the general population of the University?
- How can the enrollment in CHE 204 (an outer core general education course) be brought up to sustainable levels?
- Can an accelerated general chemistry course be created so that high-achieving, first-semester freshman have a better alternative to starting in the off-semester General Chemistry II or in Organic Chemistry I?

#### **6. Enhance support for teaching and research instrumentation**

Chemical instrumentation requires maintenance and repairs. As we have witnessed this month, a typical service visit for a simple repair costs between \$3,000 and \$6,000 (excluding parts in most cases). Furthermore, an increasing number of instruments use costly vacuum pumps that

must run continuously, and therefore have a defined lifetime of approx. 3-4 years. It is imperative that we have the budget to adequately support existing instruments and keep them functioning past their initial warranty periods.

**7. Examine alternative instructional methods, particularly in Chemical Education**

The nature of course offerings is changing around the world as more entities offer online education opportunities. We would be remiss to not examine ways our own Department can use alternative instructional methods to strengthen our current program and reach students we are not currently reaching. For instance, opportunities exist for certain bottleneck courses that transfer student often must take, so we are offering Analytical Chemistry I (CHE215) this summer. Faculty members Chris Mulligan, Thomas Zona, and Bob Quandt have participated in the Provost-supported program to design a quality online course in recent semesters. Further investigation of the opportunities there is warranted. One area of particular opportunity is in our Chemical Education division. Hundreds of in-service teachers from across the nation have enrolled in a series of online courses, offered through the Full Cost Recovery model. These courses promise to raise the visibility of the Department to teachers and students across the nation. By continuing with these programs, the Department can become a nationwide leader in the field of Chemical Education. This is a natural position for a leading undergraduate Chemistry Department in a leading Teacher Education institution. Progress was made this year in a long term plan. In the coming year, the Department will look for ways to have the courses staffed more permanently, and perhaps start a new cohort in the MCE and MSCE programs through FCR. One limit to the MCE and MSCE enrollments has been availability of content courses that meet in-service teacher scheduling demands, thus limiting the interest to local teachers. Development of some online-only content courses, then, would also expand our possible enrollments across the nation while creating courses that could enhance our traditional programs. Such courses could also find utility in our outreach programs, such as those we offered to Army National Guard Civil Support Teams in FY13. We added one course in FY15 so far and there are plans to add two content courses in FY16.

**8. Examine the possibility of study abroad programs**

Chemistry and Biochemistry students are often discouraged from studying abroad for the impact it may have on their time to degree. The possibility of creating a partnership to study abroad without falling behind in a degree track is being heightened by student exposure to a growing number of students from abroad studying at ISU, particularly through the Science Mobility Program of Brazilian students we have helped support for several semesters. Many other departments and units have established programs and partnerships and we seek to build upon FY15 preliminary discussions about the possibilities for our students and go farther in FY16.

### **2.1.c. Relationship of the Objectives to Educating Illinois**

The Department is committed to supporting and promoting the goals of *Educating Illinois*. These goals align well with the overall mission of the Department, and each objective described above relates to multiple goals of *Educating Illinois*.

#### ***Educating Illinois Goal 1. Provide a supportive and student-centered educational experience for high-achieving, diverse, and motivated students that promotes their success.***

The aim of each of the objectives is to improve and enhance the student experience. This is to be done directly through student support (Objectives 1 and 6) or through enhancements to the learning environment that promotes a student-centered experience (Objectives 2, 3, 4, 5, 6, 7, and 8). Each of these objectives target the strategies for Goal 1: they will help to attract and retain high-achieving, diverse, and motivated students; increase opportunities for students to engage in high-quality, high-impact educational experiences; and provide integrated and holistic services that support students' individual needs. Objectives 5 and 7 address the strategy in which Departments can identify steps that can be taken to shorten time to degree.

#### ***Educating Illinois Goal 2. Provide rigorous, innovative, and high-impact undergraduate and graduate programs that prepare students to excel in a globally competitive, culturally diverse, and changing environment.***

To be competitive in the global, diverse, and changing environment, students must have access to the same resources that they will encounter after earning their degree. The quality of the education provided in Chemistry relies on several factors, including physical infrastructure (Objectives 2, 3, and 6), student opportunities (Objectives 1, 3, 5, and 8), and up-to-date curricula (Objectives 5, 7, and 8).

#### ***Educating Illinois Goal 3. Foster an engaged community and enhance the University's outreach and partnerships both internally and externally.***

Building student support (Objective 1) will build relationships with students in the program through academic and career advising and thus, as the students graduate, build better relations with alumni. The program coordinator requested in support of Objective 1 will pay great dividends in the Department's efforts to engage in external partnerships. We currently have extensive outreach efforts (Children's Discovery Museum, State Farm Millennial Girls Project, ProjectSEED, Expanding Your Horizons, Illinois State Fair Project, Boy and Girl Scouts of America, Chemistry Olympiad, to name just a few), that are poorly coordinated because they are all done on an ad hoc basis by faculty. These activities, along with our current and past corporate partnerships (ADM, Gillette, AOCS, Abbott), directly address Goal 3. Development of online materials (Objective 7) will help with outreach workshops such as for the Army National Guard Civil Support Teams we have previously conducted. Even the facilities enhancements (Objectives 2, 3, and 6) will build pride and allegiance to the University as the program will make a better impression on current students, visiting alumni, and external visitors.

#### ***Educating Illinois Goal 4. Enhance institutional effectiveness by strengthening the organizational operation and enhancing resource development.***

We are committed to improving the Department's effectiveness through improvements in processes, procedures, and procuring external resources. The rational development of the Department's

infrastructure as described in this document will greatly enhance the faculty's competitiveness for external funding. Each objective is aimed at making the Department of Chemistry more accountable and fiscally responsible. The student support infrastructure (Objective 1) will provide the students better return on investment through more effective advising (shorter time to degree) and better career advisement (improved career placement). Investments in infrastructure (Objectives 2, 3, and 6) and support (Objective 4) will result in increased productivity. Improving the General Chemistry program (Objective 5) and implementing the new laboratory courses will ensure that students have the best educational experiences in Chemistry.

The Department of Chemistry's objectives also closely align with the *CAS Strategic Plan 2010-2015*:

***CAS Strategic Focus 1. Facilitate Academic Excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Increase available research space (Objective 2)
- Devise a rational plan for recapitalizing teaching laboratory instrumentation (Objective 3)
- Increase support for MS students (Objective 4)
- Examine the General Chemistry Program (Objective 5)
- Enhance support for teaching and research instrumentation (Objective 6)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 7)
- Examine the possibility of study abroad (Objective 8)

***CAS Strategic Focus 2. Enhance the systems and infrastructure supporting academic excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Increase available research space (Objective 2)
- Devise a rational plan for recapitalizing teaching laboratory instrumentation (Objective 3)
- Enhance support for teaching and research instrumentation (Objective 6)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 7)

***CAS Strategic Focus 3. Diversify and enhance financial support for academic excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Devise a rational plan for recapitalizing teaching laboratory instrumentation (Objective 3)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 7)

***CAS Strategic Focus 4. Share and promote our academic excellence***

- Build the student support infrastructure in the Department (Objective 1)
- Examine the General Chemistry Program (Objective 5)
- Examine alternative instructional methods, particularly in Chemical Education (Objective 7)
- Examine the possibility of study abroad (Objective 8)

## **2.2. Personnel Requests: New Tenure-Track Faculty**

### **2.2.a. Assistant Professor in Biochemistry**

There is a definite need for a tenure-track faculty member in Biochemistry. The Department now offers an American Chemical Society-Certified degree in Biochemistry in response to the increasing importance and popularity of the field. As we have been recruiting and talking with students at Open Houses, it is clear that many students are interested in biochemistry. The field is clearly becoming more important as biomedical, forensic, and genomic sciences grow. This degree program requires more regular course offerings in Biochemistry (all required courses in the new major are active in FY16), and there will be an increased student demand for related research opportunities (biochemistry is already a very popular research area with students). A new faculty member in Biochemistry is thus needed in anticipation of this area of growth.

### **2.2.b. Assistant Professor in Multidisciplinary Chemistry**

With recent personnel shifts, there is a need for a tenure-track faculty member in the Department who can assist in teaching in several subdisciplines. The most recent loss of a physical chemist hurts our abilities in offerings there, but a strictly single-disciplinary chemist is not necessarily needed as a replacement as disciplinary borders blur in modern science. We nominally seek a chemist who can complement our current faculty. The candidate must be able to teach courses in at least one chemical subdiscipline and be able to contribute to our faculty in physical chemistry, biochemistry, general chemistry, organic chemistry, and/or inorganic chemistry.

## **2.3. Personnel Requests: New Tenure-Track Faculty Other**

We have no requests relevant to this area for FY16.

## **2.4. Temporary Enhancement Fund Requests**

The following requests relate to improving either safety of the Department's operations, the usability of its facilities, or both. Each request is tied directly to goals 1 and 2 of *Educating Illinois*, which seek to enhance the programmatic excellence of the undergraduate and graduate experience.

### **2.4.a. Strategic Budgeted Carryover ONLY Requests**

#### 2.4.A.1. ADVISOR SALARY

With the personnel funds received from variance, the Department hired replacement NTT faculty and an AP advisor. In the absence of permanent budget item, residual funds from the variance will be used in FY 16 to continue to support the temporary advisor position and anticipated NTT shortfalls.

#### 2.4.A.2. ADVISOR SALARY

With the personnel funds received from variance, the Department hired replacement NTT faculty and an AP advisor. In the absence of permanent budget item, residual funds from the variance will be used in FY 17 to continue to support the temporary advisor position when variance funds are unavailable.

#### 2.4.A.3. STARTUP COSTS

Funds from FY15 will be used to assist the College in supporting the startup costs for faculty member(s) who should join us in FY17.

#### 2.4.A.4. SUMMER SALARY ACROSS FISCAL YEARS

Funds provided for salaries of summer instructors in FY15 will be used to pay the instructors as they complete their courses in FY16.

#### 2.4.A.5. ANTICIPATED LEAVE REPLACEMENT

Current variance funds will be in used in FY17 to cover anticipated leaves and NTT shortfalls.

### **2.4.b. Strategic Budgeted Carryover Requests supplemented with Provost Enhancement**

No budget request in this area for FY16.

### **2.4.c. Other Enhancement Requests**

#### 2.4.c.1. FACULTY PROFESSIONAL TRAVEL

The cost to attend a professional meeting in Chemistry is approximately \$1,250 to \$1,500. Although we should provide the equivalent of one paid trip to a professional meeting per year, it is more reasonable to expect funding for one trip every two years. Therefore, we request professional travel funds for 10 faculty members (half the faculty). **The total request for Faculty Professional Travel is \$15,000.**

#### 2.4.c.2. STUDENT TEACHER SUPERVISION TRAVEL

As in FY14, we have hired a NTT to supervise our students in the Chicagoland area to minimize the costs associated with supervision travel. The cost burden has been shifted to our personnel side so this request is lower than in previous fiscal years. **We request \$2,000 for student teacher supervision travel.**

#### 2.4.c.3. INTERNSHIP TRAVEL

**We request \$500 for internship travel.**

#### 2.4.c.4. INSTRUCTIONAL TRAVEL

**We request \$1,000 for instructional travel.**

#### 2.4.c.5. INSTRUCTIONAL CAPACITY

**A total of \$63,055.75 is requested for non-General Education Instructional Capacity (form attached).**

#### 2.4.c.6. INSTRUCTIONAL CAPACITY FOR GENERAL EDUCATION

**A total of \$172,497 is requested for General Education Instructional Capacity (form attached).**

## **2.5. Permanent Funding Requests**

We continue to seek funds to invest in infrastructure and direct student support services. Both are key components of the University's pledge to students and academic programs in *Educating Illinois*. Because of shrinking resources over the years, faculty members have been expected to take on additional roles for which they have little time and administrative support, and the Department has had to seek alternative routes to equip teaching and research labs.

The following requests for permanent funding are meant to address these shortfalls. They will simultaneously boost faculty productivity and morale, as well as ensure compliance with safety and regulatory requirements. **Each of these requests is tied directly to goals 1 and 2 of *Educating Illinois*, which seek to enhance the programmatic excellence of the undergraduate and graduate experience.**

### **2.5.a. Program Coordinator**

#### ***(Overall Priority 1 – Personnel, AP or CS)***

The Department of Chemistry has long relied on faculty members for many of the student and program support functions that are handled by staff members in most other departments. Among the jobs that have been handled by these faculty members are: academic advisor (one lead and, in previous years, 3 or more assistant advisors), career placement, co-op/internship coordination, alumni relations, scheduling, safety, recruiting, outreach, publicity, and web editing. As a result, 8-10 faculty members far exceed their expected 20% commitment to service, and this extra load has a significant, negative impact on the teaching and scholarly activities of these faculty members and on the advising experience of students. Chemistry is already a very productive department; by reassigning these functions to a staff person we should expect to see real gains in teaching effectiveness and scholarly productivity. It is also well-known that retention rates are improved by effective interactions with advisors.

Although Chemistry already has a modest support staff, none of these staff members had direct student support as a component of their job function. We have three professional staff members dedicated to laboratory support: an instrument technician, a chemical stockroom manager, and a chemical stockroom worker. We have three office and budget support staff: a laboratory manager that deals with budgets, ordering, and invoices, an office manager, and an office support specialist. All are essential to the Department's operation, but none are student-centered.

We propose to create a Program Coordinator position that will have responsibilities in academic advising, career counseling and placement, chemical safety, student recruiting, website maintenance, publicity, and alumni relations. Clearly the position will pay immediate dividends by increasing teaching and research productivity, improving student experience through enhanced career and academic advisement experiences, promoting safety in the teaching and research labs, and in alumni relations. We have temporarily used variance funds to hire an academic advisor (AP) to perform only *some* of these duties and have already noted an increase in faculty and student morale and student advising in the past fiscal year. Through effective advising and recruiting we expect to see our retention rates increase and to also see improved entering students, who will be successful in growing our program. The proposed position will have a profound impact on our students' experience. **We request a 12-**

month salary of \$50,000 for the Chemistry Program Coordinator. *This request relates to all four Strategic Foci of the CAS Strategic Plan.*

### **2.5.b. Chemical Inventory Software**

#### ***(Overall Priority 2 – Contractual; Tech Tuition)***

Federal and state regulations require the Department to maintain updated inventories of chemicals (in all the storage locations in 25+ labs) and track “chemicals of interest” that have been identified by the Department of Homeland Security. To meet these requirements, and to make access to the inventory simpler for faculty and students, we established an online inventory system with bar coding and location tracking. The system requires an annual subscription which will be supported by this request. **We are requesting \$11,000 in permanent contractual dollars for the software subscription.** *This request relates to Strategic Focus 2 of the CAS Strategic Plan.*

### **2.5.c. Teaching and Research Instrumentation Budget Increase**

#### ***(Overall Priority 3 – Equipment)***

In order to replace mid-level instrumentation (costing between \$15,000 and \$100,000) we require a base increase in the Department’s equipment budget. This will allow for the purchase of additional instrumentation, and with the implementation of strategic carryover budgeting will facilitate saving for equipment costing near the higher end of the range. This enhancement is critical for maintaining program quality. **The total request is for an increase of \$20,000 in permanent funding.** *This request relates to Strategic Foci 1, 2, and 3 of the CAS Strategic Plan.*

### **2.5.d. Increased Support for Graduate Students**

#### ***(Overall Priority 4 – Personnel, Graduate Assistants)***

Summer research is required for students in the M.S. program to complete their degree on time. Unfortunately all but the few graduate students supported by research assistantships are expected to do summer research without compensation. Many cannot afford to do this, and so they are forced to work outside jobs during the summer or even leave the Bloomington-Normal area for the summer. This results in a decrease in productivity by the student (and thus the faculty member) and an increase in time to degree. We postulate that lack of summer support in our program contributes to some of the current realities of declines in graduate applications and enrollment. We propose to provide competitive summer stipends for the MS students and to increase the number supported during the academic year. Such a program is likely to have an immediate impact on Departmental productivity, and should lead to an increase in the success rate of external research proposals. Therefore this expenditure should be considered an investment, one that may decline as more research assistantships can be supported by external funds. **We request 27 months of additional GTA funding (\$1,275/mo) that can be used for summer support and/or an increased number of GTAs during the academic year if demand increases. This amounts to \$34,425 in permanent funds.** *This request relates to Strategic Focus 1 of the CAS Strategic Plan.*

### **2.5.e. Summer Advising, Recruiting, and Planning**

#### ***(Overall Priority 5 – Personnel)***

Crucial activities are carried out during summer months in preparation for each academic year. The Lead Advisor, Graduate Coordinator, and Associate Chair(s) all have intensive summer roles for which they receive remuneration only if there is remaining variance. Having a permanent budget line for these activities will allow for better long-term planning of the responsibilities of these positions. **The total request is for \$16,000 in permanent funding, which can be reduced to \$10,000 if item 2.5.a is funded.** *This request relates to Strategic Foci 1, 2, and 4 of the CAS Strategic Plan.*

### **2.5.f. Teaching and Research Instrumentation Support**

#### ***(Overall Priority 6 – Contractual)***

The Department of Chemistry operates a substantial number of high-end instruments (meaning those costing more than \$10,000). Annual service contracts for these instruments typically run 10-20% of the cost of a new instrument. In many cases, we do not have resources to provide service contracts and instead rely on the instrument technician to make repairs. This takes time away from her other critical support duties for the teaching and research labs. When a new piece of equipment is purchased (either with Department funds or through grants), it is critical to provide maintenance support through service contracts. This becomes even more important as we are being asked to use our current contractual funds for routine facilities maintenance. **We therefore request an additional \$25,000 in permanent contractual funding for service contracts.** *This request relates to Strategic Foci 1, 2, and 3 of the CAS Strategic Plan.*