

Chemistry Department Strategic Vision and Plan
Approved May 31, 2007

AFFIRMATION

History

About 150 years ago, New Hampshire College was founded in Hanover with a single professor – Ezekiel Dimond – a chemist, who taught all chemistry courses there and at Dartmouth. In 1906 (as NHC became UNH), research was an expected part of undergraduate preparation in chemistry, a tradition which has produced hundreds of undergraduate research theses since then. Fifty years ago, the Chemistry Department was first in the physical sciences to establish a Ph.D program. The new century finds the Chemistry Department educating a population of 50 graduate students, 70 undergraduate majors, and 1600 non-majors. Measured in per person publications, presentations, and external dollars, the chemistry faculty maintain a steady level of scholarly activity. Together, the contributions of the department to CEPS and to UNH balance the academic missions of teaching, scholarship, and outreach. It is within this history and context that this strategic plan has been developed.

Identity

The UNH Chemistry Department is a place of educational, professional, and personal transformation. Both students and faculty are actively engaged and supported in this process – students transforming into colleagues; faculty transforming into stronger and more balanced teacher/scholars; both groups growing into a community of learners. The faculty model is that of teacher–scholar–communicator: an individual who values helping the inexperienced learn, who engages in inquiry, and who shares knowledge and processes openly, including with the general public. The term “transformation” suggests more than incremental change, and more than just adding value. It suggests a commitment to nurturing personal and intellectual growth.

Mission

The primary educational mission is to develop:

- a) chemistry majors who display independent thought, professional skills and demeanor, and advanced knowledge so that UNH chemistry graduates will be sought after.
- b) in non-chemistry majors, sufficient knowledge and skill to apply chemistry successfully within their disciplines and as responsible citizens.

A parallel mission is to develop new knowledge (grounded in the disciplinary divisions of analytical, inorganic, organic, and physical chemistry, and chemistry education) and to have students intimately involved in that development.

We also feel a responsibility as a department (and as individuals) to serve other groups who make decisions requiring chemical and scientific knowledge.

- a) In disciplines whose lines of inquiry rely on the central science of chemistry (e.g. biology, materials science, environmental sciences)
- b) In the public domain – K-12 instruction, business and industry, public policy

Aspirations

The UNH Chemistry Department will provide the undergraduate curriculum and personal attention of an elite undergraduate 4-year college; a research profile (students, publications, degree programs) that is competitive with other MS and PhD research-intensive chemistry departments, but proportionate in size; and a level of external engagement that creates opportunities for others to share in our knowledge, expertise, and enjoyment of discovery.

STATUS

Strengths

Tradition We have a long and strong history of commitment to student learning through individual mentoring and engagement in scholarship. High program quality is a key feature. Alumni are loyal and very successful, contributing financially and programmatically.

Faculty Faculty balance teaching and research as an ideal. We are committed to excellent teaching, and generally deliver on that goal. We all teach at both graduate and undergraduate level. All faculty are active in research and many have national leadership positions. Faculty longevity is an important characteristic and testament to the quality of our programs and to the ability to achieve professional success at UNH.

Support Staff Our support staff (office, labs, stockroom, library) are excellent. Longevity and commitment to supporting student learning are key strengths. We could not sustain the quality of our programs without these dedicated and efficient people.

Undergraduate and Graduate Programs The undergraduate curriculum, as approved by the American Chemical Society, is of high quality. Our rigorous BS research thesis is a gem. Students in BS program earn an "ACS Certified" degree. Efforts to increase graduate student diversity have been successful and place chemistry among the campus leaders on this front. We are unique nationally in matriculating students in graduate chemistry education programs (PhD Option in Chemistry Education; College Teaching degree programs).

Campus Leadership Department faculty have held leadership roles in broad campus missions, such as the Discovery Program (creating three Inquiry Courses), graduate student diversity, and the College Teaching Programs.

Resourcefulness Collectively the department manages to "rise to the occasion", "do more with less", "make lemonade out of lemons", and "roll with the punches".

Challenges

Faculty Composition We are depleted in number relative to our historical size and, despite contracting course offerings and increasing class size, are continuously stretched to sustain quality of activities, and challenged to maintain balance across research, teaching, and outreach. As a department, we have contributed strongly to the Discovery program, to teacher education, and to outreach activities (e.g. through Leitzel Center) – but we could do much more with a few more faculty colleagues. We need to enhance faculty diversity (we have one newly-hired female assistant professor). We also lack critical mass in several divisions (the divisions are analytical, inorganic, organic, physical, chemistry education), each of which has its own unique teaching responsibilities. Critical mass provides a breadth of research activity in a division that is attractive for graduate recruiting and provides intramural research mentoring to support grantsmanship. It also creates flexibility in assigning faculty to teaching and governance roles. Lastly, temporary faculty, hired to teach in important large service courses because of unfilled tenure-track positions or sabbatical replacements, despite careful screening, have presented unpredictable challenges that have required significant advising and sometimes intervention by the tenured faculty.

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Time Faculty and staff are over-extended, and lack significant blocks of time for the deep intellectual effort needed to prepare proposals and to do research. Our graduate program requires streamlining to allow students to focus on research and make faster progress without compromising quality.

Recruiting Our personalized and high-quality programs should be attracting more attention.

Graduate Students Teaching Assistants, who are critical to the laboratory instructional mission, have compensation that is too low relative to our competition. Student concern about financial survival is interfering with recruiting, education, and research productivity.

Facilities Space in Parsons is tight and inflexible. Small classrooms have poor acoustics and lighting. No rooms are designed for student small group discussion. Basic lab safety equipment should be upgraded (e.g. eye wash stations). Ceilings, walls, floors are deteriorating. Air quality is poor in some places. Modern research and instruction requires air conditioning for efficient and productive use of space and people year round.

Records and Scheduling Large course faculty (gen chem and organic) waste time in records management – maintaining rosters, updating spreadsheet records, meeting reporting requirements (R+30, first-year & transfer & athlete reports, final grades). Risks of catastrophic loss of course information is real because there is no central administrative support for this. This is particularly an issue with temporary faculty. Blackboard helps but is not a complete solution.

Budget Budget has not kept pace with costs, internal fees, and inflation. We have survived through good management and luck. We need a budget that realistically covers and invests in the costs of undergraduate education and provides a stable base for graduate research activities. The department does not benefit (directly) from the intellectual capital and extensive instructional efforts of its faculty.

FRAMEWORK

Overarching criteria for goals:

- Leveraging: Make things count double (or more). Seek symbiotic or synergistic relationships.
Broadening: Choose to do things that strengthen us as an entity
Mentoring: Active, direct mentoring (a “working with” attitude) is critical to sustain our Identity, Mission, and Aspirations.
Financing: Seek ways to enhance revenue through staffing, instructional offerings, research activities, and alumni contacts.

Overarching criteria for actions:

- ◆ Address issues that are realistically within our control.
- ◆ Focus on actions where there is a large ratio of potential outcome relative to intervention.
- ◆ Recognize that faculty time is precious and limited.
- ◆ Rely on data, particularly regarding quality of our efforts (students, publications, etc.)
- ◆ Be consistent with the vision and aspirations of the department and UNH

Strategic Goals and Action Items
Executive Summary

We believe our current efforts have been true to our Identify and Mission. To continue to move in the direction of our Aspirations, we propose the following set of Goals and Action Items be accomplished by 2010. (*Implementation status in brackets*)

1) **Increase faculty number and diversity through pro-active recruitment**

Newly-hired physical chemist, replacing a long-unfilled tenure-track line, is the result of two years of pursuing candidates and early advertising. We will continue to seek candidates in anticipation of retirements (Physical Chemistry within the next year), to take advantage of new directions (in particular, Chemistry Education), and to reach critical mass within the divisions. We will continue to identify established faculty at other institutions, and rising graduate students and postdocs, who might fit our department model well, as potential future colleagues. Having additional colleagues is critical to achieving several goals and action items listed below, including expansion of student populations, increasing level of scholarly activity, more productive proposal submissions, and sharing of departmental management responsibilities. (*ongoing*)

2) **Develop programs to help entering students improve knowledge and skills**

Various support mechanisms are being explored in Chem 403/404 including Peer-Led Team Learning, faculty recitations, and active and cooperative pedagogic methods. Mathematical knowledge and skills as these affect chemistry learning are being studied. Our learning goals include content goals AND motivational and social goals, especially for first year students. (*ongoing*)

3) **Strengthen contacts with alumni**

Goal statements:

- (1) **Create loyal alumni while they are still here.**
- (2) **Sustain loyalty by continued engagement.**

Action Items:

- (1.1) Identify routines that can become inclusive traditions, including alumni events
(*ad hoc committee, recommendations by Dec 2007*)
- (1.2) Chair holds informal meeting with undergrads and grads.
(*begun 2006*)
- (1.3) Coordinators perform exit interviews with outgoing grads
(*begun with undergraduates 2007*)
- (1.4) Five-year post-graduate survey
(*initiate in 2008*)
- (2.1) Update alumni data base
(*complete by Fall 2007*)
- (2.2) Establish web-based alumni communication vehicles
(*complete by Spring 2008*)
- (2.3) Establish routine set of alumni events at reunions and national meetings
(*Alumni & Industrial Relations Committee, by Dec 2007*)
- (2.4) Explore establishment of Chemistry Advisory Committee

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(A&IR, recommendations by Dec 2007)

- (2.5) Engage alumni with Parsons renovation
(Parsons Renovation Committee, recommendations by Dec 2007)

4) **Graduate curriculum should be consistent with apprenticeship model**

Goal statements:

- (1) Streamline requirements**
- (2) Focus on formative assessment**
- (3) Provide other professional development opportunities**
- (4) Review TA time demands and intellectual development associated with being a TA**

Action items:

- (1.1) Move advisor selection from January to Thanksgiving.
(implemented 2006)
- (1.2) Establish norm of 3 grad courses in Fall of first semester
(implemented 2006)
- (1.3) Establish fixed schedule for committee meetings with students
(Curriculum Committee, recommendations by Dec 2007)
- (2.1) Examine major requirements of progress reports, seminar, proposal with strong focus on purpose each services as learning opportunity
(Curriculum Committee, recommendations by Dec 2007)
- (3.1) Introduce professional development program to address research skills, ethics, safety, professional behaviors
(2008)
- (3.2) Identify explicitly the skill set that we want students to develop and where in the program that this happens
(Curriculum Committee, recommendations by Dec 2007)
- (4.1) TA time inventory
(begun spring 2007; complete in fall 2007)
- (4.2) Talk with past students about aspects of program most valuable to them
(2008)

5) **Expand capacity and reach of graduate programs**

Goal statements:

- (1) Increase population of graduate research students by 10 to 20**
- (2) Investigate curriculum structures to attract new audiences at MS level (non-research professional tracks)**
- (3) Build a recruiting strategy based on our unique characteristics and goals**

Action items:

- (1.1) Include more graduate students on external grants (via more per grant or more grants). *(chair reviews outgoing grants and budgets; ongoing)*
- (1.2) Increase the number of tenure-track faculty.
(ongoing)
- (1.3) Develop industrial and alumni support for graduate students.
(Industrial & Alumni Relations Committee)
- (1.4) Start competing for NSF Fellowships and other national fellowship programs.
(Fall 2007)

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- (2.1) Explore developing program for secondary teachers.
(*Chris Bauer will develop ideas; Spring 2008*)
- (2.2) Explore establishing non-thesis MS or Certificate Programs.
- (2.3) Explore initiating BS/MS program.
- (3.1) Specifically articulate a set of shared goals in graduate recruiting
(*Graduate Recruiting & Selection Committee; Dec 2007*)
- (3.2) Develop a diversity recruiting plan consistent with Action 3.1 and fulfilling NSF expectations (*ad hoc committee; Dec 2007*)

6) **Expand undergraduate program numbers up to a steady-state population of about 80, as well as improving the academic strength of those students.**

Goal statements:

- (1) Increase external visibility with applicants and applicant advisors.**
- (2) Raise awareness among on-campus populations.**
- (3) Engage students early in intellectual and social life of the department.**

Action Items:

- (1.1) Increase visibility within NH high schools. (*2008*)
- (1.2) Increase visibility among high school juniors in Northeast.
(*Executive Committee: plans by Dec 2007*)
- (1.3) Aggressively advertise undergraduate research history via website and print
(*Executive Committee: 2008*)
- (2.1) Promote chemistry as an intellectual pursuit and career option in large-classes.
(*ad hoc: gen chem and organic instructors; plan by Dec 2007*)
- (2.2) Target pre-professional populations (e.g. pharmacy, med school)
(*Undergraduate Coordinator; report by Spring 2008*)
- (2.3) Find ways to interact with students outside of classroom.
(*2008*)
- (3.1) Identify students and get them into labs for supporting or developing instruction (accessible as first-year students), or for engagement with research (accessible as sophomores)
- (3.2) Involve undergraduates in recruiting.
- (3.3) Build on success of AXE student scientific society for outreach, tutoring, and professional opportunities for peers.

7) **Encouraging scholarly proposals**

Goal statements:

- (1) Support submission of proposals with high scholarly value such that likelihood of funding is improved**
- (2) Engage students in developing grant-writing abilities**
- (3) Identify major instrumentation needs and plan submission of major instrumentation proposals on regular basis**
- (4) Develop competitive NSF Research Experiences for Undergraduates proposal**

Action Items:

- (1.1) Encourage internal review as part of proposal preparation process. (*2007*)
- (1.2) Encourage discussion of reviews for improving resubmissions. (*2007*)

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- (1.3) Evaluate how reduction or redistribution of faculty responsibilities (class schedules, meetings, seminars) may free up larger blocks of time. (2007)
- (1.4) Provide travel funds for faculty to establish relationships with sponsors. (2007)
- (2.1) Involve students explicitly in proposal preparation and review.
- (2.2) Engage graduate students in participating in writing bona fide grants.
- (2.3) Offer 1-credit course on grant preparation, writing, review process, budget preparation, sponsor identification for any student in CEPS (*trial for Spring 2008*)
- (3.1) Identify potential departmental resource instrumentation (e.g. Raman, microcalorimeter, rapid kinetics, etc.) with potential to develop new lines of inquiry (2008)
- (3.2) Develop relationships with potential on- and off-campus partners (2008)
- (4.1) Identify a faculty team, and build on past experience of Mayne and Miller (2008)

8) **Plan ahead for Parsons re-construction**

Goal statements:

(1) Pro-active involvement

- (1.1) Establish a committee with this as specific focus
(*begun 2007*)
- (1.2) Work with foundation to identify potential alumni resources
(*begun 2007*)
- (1.3) Investigate chemistry building construction on other campuses