

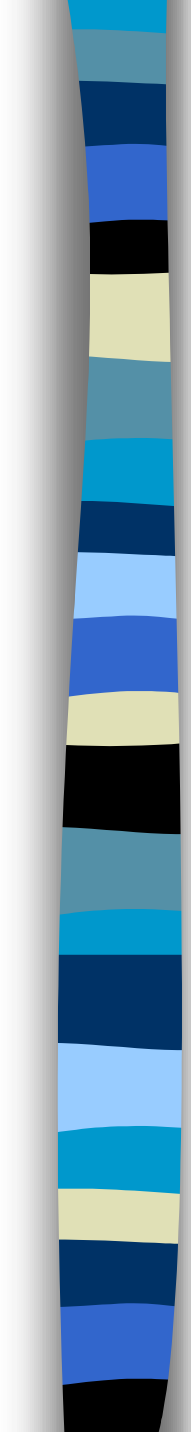
Preparing Professional Chemists: Research in the Doctor of Chemistry (DChem) Program



Lynn A. Melton

University of Texas at Dallas

melton@utdallas.edu



Where do doctoral chemists get jobs? (career positions, not postdocs)

- 65% Industry
- 10% Government
- 18% Colleges and Universities
- 7% Other



In industry, what do doctoral chemists do?

- Long term chemical R&D (<50%)
 - new knowledge for eventual use
 - labs have “academic” flavor
 - academic consultants visit
- Problem solving (>50%)
 - short term response to commercial problems
 - academics don't see this part



Industrial Example: DuPont

- Academic side: Experimental Station, Wilmington, DE
- Problem solving side: Sabine River Laboratory, Orange, TX



Proposition:

Why not adapt the doctoral research training to assist students in becoming better industrial problem solvers?

We asked our industrial friends what skills were needed for their jobs. They gave us these themes:

- Broad course background
- Expectation of changing problems
- Prior industrial experience



The DChem Program (\approx 5 years)

- nine course core (3 semesters)
- problem solving examination
- research spans three Practica
 - Apprenticeship Practicum -- learn research methods, earn M.S. (3 semesters)
 - Industrial Practicum -- work for 9-12 months as a “problem solver in training” at a company site (3 semesters)
 - Fundamental Practicum --produce paper for submission to a journal (5 semesters)



Problem Solving Examination

- After coursework completed
- Applied chemistry focus
- One week to develop solution to problem
- Written and oral defense of solution
- Gateway to pursuing the DChem degree



Apprenticeship Practicum

- Relatively closely supervised
- Written report and oral defense
 - Similar to Master's thesis
 - Shows growth toward DChem potential
- Gateway to Industrial Practicum placement



Industrial Practicum

- 9 to 12 months in industry
- Grow as problem solver
- Experience industrial research
- Help solve meaningful problems
- Team participant experience
- Improve communication skills
- Prepare and defend report of work



Industrial Practicum Partners

- United Technologies
- Merck
- DuPont
- Dow Chemical
- Mannatech
- Corning
- Shell R&D
- EG&G Rocky Flats
- Mobil R&D
- Carrington Labs
- ARCO R&D
- Texas Instruments
- Syntex
- Mallinkrodt
- Rohm & Haas
- Bunsen Rush



Fundamental Practicum

- Similar to classical Ph. D. research
- High level of independence
- A new advisor
- Thesis presented for oral defense
- Results acceptable for refereed publication



Faculty Research Interests

- Electroactive polymers
- Fluorescence-based diagnostics
- MRI contrast agents
- Carbohydrate structural chemistry
- Bioinorganic chemistry
- Photochemistry
- Computer-based educational tools
- Ordered media
- Scanning probe microscopy
- Bioanalytical chemistry
- Microporous metal oxides



Faculty Research

- Successful in attracting C&G funds:
NSF, DOE, DOD, NIH, Welch
- Average research funding per faculty member: (approx) \$180K/year



DChem Results

- 90% of DChem graduates go to career industrial position straight from campus (45% for Ph.D. graduates).
- Starting salaries and advancement are same as Ph.D. graduates.
- 40-45% of DChem graduates take a career position at the Industrial Practicum company.



Employers of DChem Graduates

- American Cyanamid
- BASF
- Bayer
- Carrington Labs
- Dow Chemical
- Sandoz-Agro
- Sherwin-Williams
- United Technologies
- DuPont
- Huntsman Chemical
- Los Alamos Nat'l. Lab
- Merck
- Motorola
- Phillips Petroleum
- Syntex
- Texas Instruments



Want to know more about the DChem?

- General Program Information
 - 1-800-DCHEM14
 - dchem@utdallas.edu
- “Is there a Doctor of Chemistry in the house?”,
 - January 2000 Chemical Innovation;
 - <http://www.acs.org> “hot articles”



Problem Solving Examples

- Product adulteration
- Inactive pharmaceutical product batch
- Cheating on the race course
- Poor performance from red light bulbs