Some Novel Perspectives With a Computational Chemistry Degree

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What is a degree?

- Indicates a demonstrated set of skills and/or abilities
  - Reasoning skills
  - Technical abilities
  - Communication skills
  - Ability to learn new areas

- But where and how is the degree applied?
  - Academia
    - Teaching
    - Research
  - Industry
  - Government

- Each application area has its own challenges and opportunities
So, what do you want to be when you grow up?

• As a youngster...
  - Fireman
  - Astronaut
  - Football player
  - Construction worker
  - Computational chemist?

• In high school...
  - Rock musician
  - Business person
  - Veterinarian
  - Marine biologist
  - Computational chemist?
Why a computational chemist?

• I started out in microbiology
  - Interested in “life”
  - Discipline not detailed enough for me
  - Why did things operate the way they did?

• Moved to biochemistry
  - Looking at “life” at the molecular level
  - Better explanations for mechanisms
  - But “bad hands” for experimental work

• Then, a long, long time ago in a classroom far, far away...
  - Two “productions” by Prof. Edgar Meyer
  - The staph nuclease lecture
  - The movie of models
Why computational chemistry?

- BECAUSE IT IS COOL!!!
- Computers give it an immediate aura of mystique
- Manipulation of images is “like playing computer games”
- And the detail!

- After a four year intermission...
- Attended Rutgers University for Ph.D. in physical chemistry
  - Prof. Wilma K. Olson
  - Studied polynucleotide structure
Academia as a Student

- Days filled with classroom work and research
- Worrying about completing the degree

- But...
- Opportunity to deeply examine a problem
- Develop skills
- Find out what real research is all about
  - A picture may be worth a thousand words...
  - But it might also take a thousand calculations!
Academia as a Teacher

- Moved from Rutgers to US Military Academy, West Point, NY
- Assistant professor in Department of Chemistry

- Somewhat unique undergraduate institution
- But...

- Opportunity to see what it was like to teach day after day
  - Four sections of freshman chemistry - lecture and lab
- Not much time for research
  - Probably not the case in other undergraduate institutions
- Interact daily with young students
  - Small classroom size
Academia as a Teacher

- Experience could vary with institution

- Undergraduate institutions
  - Example: Colby College, Waterville, Maine
  - Very heavily focused on teaching and educating the students

- Graduate institutions
  - Example: University of Cincinnati, San Diego State
  - Research required as part of job but still opportunities to teach

- Research institutions
  - "Ph.D. factories"
  - Research and funding are paramount
  - Arguably teaching is a lower priority
Government Research Scientist

- Moved from West Point to the Walter Reed Army Institute of Research, Washington, DC
- Research biochemist
  - Synthetic peptide vaccine development
  - First experience with commercial software

- Full-time research
  - Much like in graduate school
- But...
- Administrative duties
- Funding issues
- Project direction
Government Opportunities

- Many labs throughout the government
- NIH - Bethesda, North Carolina
- FDA - Washington
- EPA - Washington, North Carolina, Cincinnati
- FBI - new initiatives for bioterrorism
- DOE - Los Alamos
- Military labs
  - Walter Reed
  - USAMIIRD - Frederick, MD
  - Natick Labs - Massachusetts
  - Aberdeen Proving Grounds - Maryland
Academia as Staff

- Moved from Washington, DC, to Cincinnati, OH
- Staff member in Department of Chemistry, U. Cincinnati
  - Ran molecular modeling center

- Very multidisciplinary
- No tenure problem
- But...
- Just “staff”
- Support was primary role
- Funding issues
Academia as Staff

• More common than one may realize
  - Scripps Research Institute, Texas A&M U., University of Illinois

• Several variations
  - Running a core facility
  - Being a research scientist
    • Sometimes could have own tenure system
  - Non-tenure position

• Could be unsteady
Industry

- Moved from Cincinnati, OH, to San Diego, CA
- Product Marketing Specialist with Accelrys (formerly MSI)
- Customer training manager

- Opportunity to
  - Work with top scientists
  - Encourage development directions
  - Teach and encourage other scientists

- But...
- It is business
- Must stick to party line
Thoughts on Industrial Opportunities

• Most scientists think of research positions

• Other scientific opportunities are out there...
  - Developers
  - Applications scientists and customer support
  - Consulting
  - Technical writers

• And some very unique opportunities
  - Product marketing and business management
  - Sales
  - Training
  - Human resource
  - Libraries and information searches
  - Patent law
Thoughts on Industrial Opportunities

- Experience could differ on size of company

  - Small start-up
    - Thrill of starting something new
    - Thrill when venture capital runs out
    - Opportunity to do many things

  - Mid-level company (~200 people or so)
    - Can be more focused on role
    - Opportunity to move into management or other roles

  - Large company
    - Part of multidisciplinary research teams
    - Could focus just on area of expertise
## Academia, Industry, Government? Pros

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Opportunities are out there

- **Academia**
  - Faculty or staff
  - Research or teaching

- **Industry**
  - Not just researchers
  - Other non-traditional opportunities
  - Be open minded

- **Government**
  - Consider a post-doc position
  - Variety of labs
Bear in mind...

- Work in an area where you feel comfortable
- There always tradeoffs
  - Freedom vs. pay
  - Short-term risk vs. long-term security
- Be open minded
  - Unique opportunities are out there if you just think