How to Win Graduate School

Joseph C. Ayoob, PhD

http://www.csb.pitt.edu/faculty/ayoob/

This presentation was given to the first year students of the Joint CMU-Pitt PhD program in Computational Biology (CPCB) as a part of their orientation in August 2015. The purpose was to pass along some general information from a number of sources and personal experiences to help prepare them for successful tenures in the CPCB program and a head-start in securing a position for the next step in their scientific careers. While most of the advice is general for students pursuing PhDs in biology and related fields, some of the advice is specific to the computational biology students in the CPCB program. Dr. Ayoob is thankful to the many colleagues who helped shape this presentation and especially to Dr. Matt Might for The Illustrated Guide to a Ph.D. and his reminder to all students to “Keep Pushing”.
Grad School – why are you here?

The Illustrated Guide to a Ph.D.

To Obtain & Contribute to our KNOWLDEGE

Matt Might

Please visit Matt Might’s full Illustrated Guide to a Ph.D. at http://matt.might.net/articles/phd-school-in-pictures/
Grad School – how do you get there?

The Illustrated Guide to a Ph.D.

Matt Might

Please visit Matt Might’s full Illustrated Guide to a Ph.D. at http://matt.might.net/articles/phd-school-in-pictures/
Grad School – it doesn’t just stop ‘there’

The Illustrated Guide to a Ph.D.

Matt Might

Please visit Matt Might’s full Illustrated Guide to a Ph.D. at http://matt.might.net/articles/phd-school-in-pictures/
Grad School – why are you here?

The Illustrated Guide to a Ph.D.

To Obtain & Contribute to our KNOWLDEGE

...and to prepare for your...

CAREER

Matt Might

Please visit Matt Might’s full Illustrated Guide to a Ph.D. at http://matt.might.net/articles/phd-school-in-pictures/
Advice is here and everywhere, **BUT** you have to define your own path/process define mutual goals and expectations with your advisor(s)

Peers can be a good guide, **BUT** they shouldn’t be your measuring stick e.g., introverts and extroverts process, think, and work differently

All have different advice and experiences, **BUT** some advice is universal don’t be a $#!& (insert your favorite 3-4 letter word)
Your job search starts now
(at least thinking about what you want to be when you grow up)

How Do You Find the Right Career?

Be Proactive and Creative

- Research your options
- Take self-assessments
- Make a career plan
- Build new skills
- Start job searching

see 1-page guide for links
talk to people and network

myIDP @ sciencecareers.org

keep track of what you’ve done

see 1-page guide for links

Career Options and Job Resources
Tianna Hicklin, Ph.D.
some basic advice

networking &
getting involved

career planning

funding

ka myoo nah kay shun

CPCB 1 page guide to graduate school

Work hard... duh... and seek advice of others.

- Strive to become an expert in something
  - 10 Simple Rules for Reproducible Computational Research
  - Other 10 Simple Rules from PLoS Comp Bio

- Perspectives from previous/senior graduate students:
  - http://physrev.net/PhD-memoir.htm

- An oldie, but a goodie: The Final Exam – Don Coffey

Be an active member of the science community and start networking (it’s not a dirty word).

- Go to seminars/events (in the program/your department & elsewhere) and meet with visiting speakers.
- Actively listen at talks (stay off your phone and computer, unless you’re taking notes).
- Present your work locally and at regional/national conferences – they get additional perspectives on your work.
- Get involved with Grad Student Association and/or CPCB Government.
- Create a LinkedIn profile, connect to people, and join groups – they are a great source of info (jobs, etc.).
- Look for mentors who will help guide you along your career path.
- Look for opportunities to get teaching experience and to be a mentor for a nascent scientist.
  - Summer undergrad and high school programs have opportunities for both (great to build your CV).
- Be an active TA – do more than just the minimum.

What do you want to be when you grow up?

- Consider job prospects and paths early in your career (some useful blogs/websites/info below)
- Highlight and keep track of all of your accomplishments and academic activities in an updated CV.
- Be active in your professional development – keep up to date on career options, fields, and trends.
- Consult the following links for job postings, info on career paths, and career development advice:
  - http://www.sciencemag.org/content/337/6099/1149.full  http://mridp.sciencecareers.org/

Show me the Money!

- Establish a track record of funding early – money begets money in science.
- Seek grad student fellowships (NIH F33, NSF GRFP), internal university awards, conference travel awards, etc.

Put your best words forward.

- Become an effective communicator – this is incredibly important in science today!
- Seek out assistance in writing and presenting.
  - Writing Centers: CMU – http://www.cmu.edu/wcc/  Pitt – http://www.writingcenter.pitt.edu/
- Prepare and practice for all talks you will give
  - You never know who is going to show up.
  - Talks/presentations are a great opportunity to make a good (or bad) impression.
- Useful Links: Gopen and Swam on Science Writing  Zuckerman on writing
  - Zhan on writing
  - Bourne on oral presentations
  - Erren and Bourne on poster presentations
  - JCA Presentations Pointers
- Give credit where it’s due. Prior work, plus acknowledge any assistance, ideas, materials, & guidance received.

Don’t be afraid of the F-word – Failure is an important part of success.

Get a life!

Seek a work-life balance.
Make sure you have an outlet(s) and have fun!
What do you want to be when you grow up?
(with or without a doing a postdoc)

Tenure-track faculty
  research + teaching + service + mentoring + granting + managing...
Teaching- or Research-track faculty
Biotech/Industry/NIH scientist
Scientific/technical writer
Journal editor
Grant/academic administrator
Consulting
  Finance (Boston CG, McKinsey)
  Government (Booz Allen Hamilton)
Public policy (Rand/NIH/NSF/Capitol Hill)
Patent law
Technical sales

No matter which path you choose, you need to put the most into your graduate school studies and work
What else will you learn during your PhD?
(some answers to what exactly gets Piled higher and Deeper)

- Independent and team-based research
- Proposing, planning, executing, and managing (multiple) projects
- Problem solving and the scientific method
- Critical thinking
- Data analysis and management
- Communication (oral, written, interpersonal)
- Preparing and delivering public presentations
- All your quantitative and computational skills
- Working knowledge of your field
- Mentoring/coaching/teaching experience
- Being detail oriented and able to translate work to bigger picture
- Ability to meet deadlines
- Budgetary skills
- etc...
Who are you?
(your CV is your academic passport – keep it up to date)

Curriculum Vitae = Course of your Life = Catalog of your academic career

Education  Teaching
Research     Service
Publications Mentoring
Presentations Professional Memberships
Honors/awards Other relevant experience(s)

Lots of formats – make sure yours is organized and consistent throughout.
Keep it up to date (when you do something noteworthy, put it on your CV).

WhoRU?
(Resumes are succinct and tailored)

Will likely only get a 10 sec. review
Most relevant (to them) skills/experiences/accomplishments (quantified)
Different for every job posting (use their key words)
Speak actively and carry a big stock (of words)

- Developed
- Analyzed
- Designed
- Wrote
- Published
- Presented
- Determined
- Administered
- Moderated
- Collaborated
- Demonstrated
- Formulated
- Fabricated
- Assessed
- Collected
- Devised
- Evaluated
- Encouraged
- Facilitated
- Trained
- Reviewed

A CPCB Grad’s Resume...

Expertise
What can be offered

Most recent experience

Active words
Quantified

Relevant contact info
(email, phone, web, github, LinkedIn)

SUMMARY
- PhD in Computational Biology with specialization on analysis of dynamical and evolutionary properties of proteins using incomplete and ambiguous experimental structure datasets.
- Solid background in data analysis, software engineering, and computational modeling, and excellent machine learning skills.
- Passionate about learning new technologies, building data analysis and visualization tools and pipelines to solve real world problems.

EXPERIENCE
Fellow at Insight Data Science, Mountain View, CA Jan, 2014 - present
- Created EURoute.me app that suggests vacation routes in Europe to maximize traveler experience
- Consolidated data from Wikivoyage and EuroRail to build a graph of cities using NetworkX
- Recommended routes based on traveler interests along with factoids calculated for each city
- Designed an interactive front end using Flask, jQuery, Google Maps API and deployed on AWS

Research Associate at University of Pittsburgh, Pittsburgh, PA 2010 - 2013
- Created ProDy API and software suite in Python/C/TCL for protein structure and sequence analysis, that received $1.1M grant support from NIH-NIGMS for further development
- Handles missing structure data and ambiguities in sequence alignments (pandas for proteins)
- 4 to 80x faster parsers and 10x more memory efficient classes compared to other Python APIs
- Implemented SQL-like selections for atoms, e.g. “same chain as name CA and within 5 of water”
- Implemented C modules for information theoretical calculations on sequence alignments
- 1000+ users from 300 institutions worldwide and over 182K+ downloads
- Studied protein-drug interactions using molecular dynamics simulations on CPU/GPU clusters
- Discovered inhibitors of cytochrome c peroxidase function as potential anti-radiation drugs
- Designed and initiated development of a web platform using Django and PostgreSQL for management and analysis of data from drug testing on human-on-a-chip models (http://mps.csb.pitt.edu)
- Lectured on Drug Discovery, Bioinformatics and Software Engineering Best Practices for Scientists

Graduate Intern at GlaxoSmithKline Summer 2009
- Developed Python based tools for simulating and analyzing drug target proteins

Graduate Researcher at Carnegie Mellon - University of Pittsburgh 2005- 2009
- Performed first of a kind analysis of large experimental structure datasets with missing atoms and segments to gain insights on the dynamical properties of proteins
- Performed simulations and modeling to elucidate molecular mechanism of action of a compound in zebrafish and human cells
- Implemented tree augmented naïve Bayes in MATLAB with feature selection for fMRI data

EDUCATION
Carnegie Mellon - University of Pittsburgh, Pittsburgh, PA 2009
Joint PhD Program in Computational Biology
Relevant Graduate Coursework: Machine Learning (CMU), Linear Algebra (Pitt)

Koç University, Istanbul, Turkey 2005
BSc in Chemistry
Relevant Coursework: Algorithms & Data Structures, Programming with C, Computational Science

SKILLS
Languages: Python, Javascript, C, SQL, BASH, TCL, MATLAB*, Java* (* prior experience)
Web & Visualization: D3, jQuery, Reveal.js, Flask, Django, Sphinx, BeautifulSoup
Don’t forget about the Government BS…
(The NIH BioSketch, that is)
Networking
(It’s not a dirty word)

Networking strategies

1. Don’t just look for ways that you can benefit
2. Be helpful and collaborative
3. Understand the interests/needs of others
4. Become an expert in something
Don’t be afraid of the F word

Failure ...all the cool kids are doing it.

“I have not failed. I’ve just found 10,000 ways that won’t work.” - Thomas A. Edison

different perspective

“The only real mistake is the one from which we learn nothing.” - Henry Ford

learn something from them

“When we give ourselves permission to fail, we, at the same time, give ourselves permission to excel.” - Eloise Ristad

open yourself up to great things
Don’t be afraid of the F words

**Failure** ...all the cool kids are doing it.

“I have not failed. I’ve just found 10,000 ways that won’t work.” - Thomas A. Edison

different perspective

“The only real mistake is the one from which we learn nothing.” - Henry Ford

learn something from them

“When we give ourselves permission to fail, we, at the same time, give ourselves permission to excel.” - Eloise Ristad

open yourself up to great things

Having **Fun** ...all the cool kids are doing it.
Get involved and learn by doing...

**Why?**

**...in the program**
- learn from others’ experiences
- share your expertise
- make your program & experience better
- get strong recommendations
- acquire ‘soft’ skills

**...outside of the program**
- pursue other scientific interests
- get to know your field
- networking opportunities
- discern your next step
- get $$$ / establish a track record

**How?**

- actively participate in seminars/class/MetaSchool
- CPCB government recruiting events
- be a kick-ass TA
- gain non-curricular experience

- attend other seminars
- meet with speakers
- BGSA involvement
- attend conferences – posters
- apply for pre-doctoral fellowships, travel awards, STIR, etc.
CPCB Pre-Advising Committee Worksheet

Courses
• Have you taken all of your core courses? If not, what is your plan for taking the rest of them?
• Which electives (Life Sciences, Quantitative, Specialization, Open) have you taken or plan to take?
• For electives you plan to take, did you check…
  enrollment availability?
  semesters/years in which the course is offered?
  permissions needed (if any) to take the course?
• Did you take the Ethics Course in your first summer semester? If not, did you make arrangements to take it in your second summer semester?

Thesis proposal
• Who are (will be) the members of your thesis committee?
• When will you propose your thesis?

Career musings and professional development
• What are you thinking about for a next step after grad school?
• How are you preparing yourself?
• What professional development activities have you pursued or need to pursue?
• How can we help you in your career preparations?
• Are you considering a summer internship to explore a field/company?
• What are your goals?
• Have you completed or updated your Individual Development Plan (IDP)?
• Who are your mentors and how will they assist you?
• Are you planning on going to any conferences?
• Do you have any requests for MetaSchool topics?

Taking charge of your own destiny
(or something motivational like that)