Making the most of your undergraduate career

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Local Resources - research

- What
- Why
- How
- Comments, examples, obstacles
Bottom line

• Learn everything you can in the classroom (physics, instrumentation, programming, etc.)
• Engage in research
• Take charge of your career: take advantage of opportunities and create opportunities (teaching, professional development, networking, etc.)
• Get involved in professional activities & societies (use the power of your group, department, university, etc.)
Local story: Jeff Arasmith (1993)

- Low-voltage measurements of high-temperature superconductors
- First job: Process Technician, Hewlett-Packard. Support division-wide engineering by the disposition of questionable lots of wafers, analysis of new or unusual defects, and analysis defect trends for inkjet printheads
- He was so glad to have done that research project – he was able to tell the engineers at HP something concrete that they were interested in. He got the job!
- Now: Sr. Applications Engineer, Center of Expertise, Cascade Microtech
Local story: Briony Horgan (2005)

- **Investigating Grain Boundaries in** $\text{BaCuS}_{1-x}\text{Se}_x\text{F}$ **using Impedance Spectroscopy**
- First job: Ph.D. candidate, Cornell University.
- She was able to write a strong application and I was able to write a very strong letter of recommendation. She got in!
- **Now:** Assistant Professor, Purdue University
  Planetary scientist studying surface processes and the mineralogy of Mars, the Moon, and terrestrial analogs on Earth. Co-I on the Mastcam-Z camera system for NASA's Mars2020 rover, launching in 2020
Local Resources - research

- Work in a research lab with a professor / post doc / grad student in physics or related discipline
- Gives idea of what *doing* science is like
- Achievement to discuss in a job interview
- Sign up for credit or volunteer
- Attend group meetings
  – offer to give presentations
  – seek feedback
REU: Research Experience for Undergraduates

- Do cutting-edge research in a lab in a new place
- Do interesting science
- Get paid to gain experience
- Work with a cohort
- Present a poster or talk; possibly publish
- Helpful for job and grad school applications
- Becoming very competitive
- See next slide for resources
REU: where

- NSF (Universities; summer; many programs) http://www.nsf.gov/crssprgm/reu/reu_search.jsp
- Department of Energy (National labs; summer, sometimes semesters) http://science.energy.gov/wdts/suli/
- Institute for Broadening Participation http://www.pathwaystoscience.org/index.aspx
- NASA http://www.nasa.gov/offices/education/programs/descriptions/Summer_Undergraduate_Research_Fellowships.html#.VoGdCPEzDAo
SPS SUMMER INTERNSHIPS

– Internships are broad-based learning opportunities for undergraduate physics majors in the areas of scientific research, outreach, education and policy
  • Interns receive stipend, travel allowance and housing

– Interns are placed in organizations such as NIST, NASA, AIP, AAS, AAPT and APS, in the Washington, DC, area

– Students are selected based on scholastic record and potential for future success, evidence of participation in SPS events and activities, and relevant experience
National/Local Resources: Internships

• Do summer (or AY) research in a company lab
• Find out about local companies
• Get paid to gain experience
• Helpful for job apps and grad school
• May lead to employment with that company
• Professor
• University employment center
• Example companies
  Northrop Grumman
  Hewlett Packard
  Intel
Present your work

- Give a talk or poster presentation about your research
- Your presentations become better every time you give them
- Communications experience
- Meet new people, broaden network
- Get feedback
- How? – next slide
Present your work

- Undergraduate poster sessions at your school
- Small conferences e.g. Oregon Academy of Science: [http://www.oas.pdx.edu/](http://www.oas.pdx.edu/)
- Sectional APS meetings
  (Far West section October 28-29, UC Davis, CA; Northwest Section, May 14-16, Okangan College, BC)
- Sectional AAPT meetings
- Divisional APS meetings (DPP 10/31 San Jose; DFD 11/20, Portland, .. )
- National APS often has a special undergrad program & travel support.
  March & April APS: Future of Physics Days
  [https://www.aps.org/meetings/events/futurephysics/index.cfm](https://www.aps.org/meetings/events/futurephysics/index.cfm)
- AAPT, Biophysical Society, Astronomical Society, Materials Research Society, IEEE ...
  and more
- Undergrad journals
  [Journal of Young Investigators](http://www.aps.org/meetings/events/futurephysics/index.cfm)
- Regular journals
2016 Quadrennial Physics Congress
November 3-6, 2016 • San Francisco, CA
Hosted by Sigma Pi Sigma, the physics honor society

http://www.sigmapisigma.org/congress/2016

Top Speakers including:
Jocelyn Bell Burnell, Oxford
(Discovered first pulsars);
Eric Cornell, JILA, NIST, & U. of CO
(2001 Physics Nobel Laureate for Bose-Einstein condensates);
Persis Drell, Stanford (Dean of Engineering and former Director of SLAC);
S. James Gates, U. of MD (Supersymmetry & string theory)

Interactive workshops including: Science Driving Innovation, (Physicists in the World, PR for Physicists, Taking Your Chapter to the Next Level), (Building Up the Community, Careers for Physics Undergraduates, Life as a Graduate Student), Focus on Action

Tours of exciting sites including: SLAC National Accelerator Laboratory, NASA Ames Research Center, & Google X

And more: Student poster session, Art Contest, Graduate School and summer research Expo
Local Resources – disciplinary depth

• Get the most from your classes
• Your job is to learn, so do it well
• *Everything* you learn will serve you well later in some way or another
• Your transcript may not make or break your career, but a good one certainly helps
• Visit office hours, conquer any fear of professors (their job is to teach). Go with a friend at first, if that helps.
• Volunteer in class; talk!
• Seek study groups; learning is collaborative
• Ask for reading material
• Attend the department colloquium (usually geared to a broader audience than a technical seminar)
Local Resources - faculty

- Visit faculty office hours often
- Fantastic, sometimes underused resource
- Super-critical for a meaningful letter of recommendation
- Valuable network
- Understand that it is our job and our pleasure to work with you
- Try the problems before you go and have questions. It’s OK to say you don’t know what to ask
Write your own letter of recommendation and then earn it!

Letter readers want:

• **Assessment of:** Intellectual ability, creativity, motivation, maturity, written and verbal communication, academic preparation,
  How have you demonstrated these things to your professor?

• **Specific examples of meaningful academic interactions**
  “Whatever you discuss in the letter of recommendation should be specific and detailed. It should be clear that you know this student. Admissions committees are often suspicious of grandiose praise lacking details and evidence.”

• **Mentorship, leadership, persistence or other qualities**
  “Student Z is a kind and patient mentor to the other students ..” Yes, but HOW do you know this?

• **At the beginning of the year, make a list of the specific things you would want your professor to write. Then do them! Ask the professor if that list would be helpful.**
Write your own letter of recommendation and then earn it!

Have you ..
• Visited office hours to discuss problem sets or science (not grades)? How often?
• Done some reading about your research project and visited the professor to discuss your findings or address your questions? How often?
• Interacted meaningfully with more than one instructor?
• Reached out for mentorship or advice?
• Taken a leadership or participatory role in something that professor is interested in?
Local Resources – career development center

- Look for opportunities to visit with people who employ scientists, even if you’re not immediately on the market.
Local Resources – career development center

• OSU Career Development Center (similar one at your university)
  - career fairs (real and virtual)
  - advice, workshops on resumes, networking
  - mock interviews
  - internship programs
• No opportunities? Ask your department head, dean, etc. to try to create them.
Local Resources – department alumni

- Where have alumni found employment?
- Where have alumni gone to grad school?
- They have a soft spot for you; they want to give back
- They want to advance their own interests
- Department should have a list; or a LinkedIn Group or Profile
- Find a faculty member who can refer you to an alum you find on LinkedIn
- Ask to invite a particular alum to visit ("reverse informational interview")
Local Resources – interdisciplinary breadth

• Broaden your perspective by taking courses in related sciences
• Science is interdisciplinary and working physicists are part of teams with chemists, biologists, materials scientists ...
• Physics can be an entry route to graduate school in other disciplines (statistics, oceanography, materials, atmospherics, chemistry, applied mathematics, biophysics ...)
• Your team may also include social scientists and humanities and business people
• Referrals from professors, colleagues ...
Interdisciplinary breadth
Example – computing

- Physicists are prized modelers, programmers, problem solvers
- Deepen your computational knowledge with Discrete Math, Computer Science, Computational Physics, Computational anything ..
Local Resources – study abroad

• Study physics at an institution abroad
• Broaden your horizons – science is an international endeavor
• May lead to graduate study abroad
• Find the office that facilitates study abroad at your university
• Professors often have personal connections to foreign researchers
Write a Curriculum Vitae AND a Resume (now!); LinkedIn profile (on-line resume)

• Keep your CV and resume current
• Opportunities often arise at short notice
• You may forget something –
• Record awards, research, presentations, outreach, teaching, society memberships, leadership roles ... 
• Tailor to specific purpose: different resumes for different companies (see Crystal’s WS); CV for grad school
LinkedIn profile (on-line resume)

• Create a LinkedIn profile
• Professional identity
• Used heavily by high-tech industry
• Huge network of 2\textsuperscript{nd}-level connections
• Works while you sleep
• Create an account at
  
  https://www.linkedin.com/
Local Resources - talks

• Broaden your general physics and science general knowledge
• Helps you keep abreast of new directions
• Makes you better rounded and more informed and interesting
• Helps you meet new people and learn about new places
• Specialty lectures – geared to you! Go!
• Attend your regular seminar or colloquium
• Watch the offerings from related disciplines
• Invite a speaker yourself (UG group)
• (hard to filter ... seek advice)
Teaching opportunities

• Can you be an undergrad Teaching Assistant or Learning Assistant? Or grader?
• Excellent way to learn material yourself
• Builds communication skills useful for ANY job
• Satisfaction of helping others
• Earns money
• Builds resume
• Approach your department chair, undergrad coordinator, or professor
• Ask for training and professional development
• Attend regional or national AAPT meetings to learn about physics education
Local Resources: Outreach opportunities

• Engage in outreach activities
• Satisfaction of helping others & promoting STEM
• Learn new things, meet new people, build resume
• Approach your department or college administration
• High school demos, in-house field trips, science museum demos, ...
• Example – “Discovering the Scientist Within” http://oregonstate.edu/precollege/blog/discovering-the-scientist-within-at-osu/
National Resources: Professional Organizations

- American Physical Society (APS), CUWiP sponsor
- American Association of Physics Teachers (AAPT)
- Society of Physics Students (SPS)
- National Society of Hispanic Physicists (NSHP)
- National Society of Black Physicists (NSBP)
- Other specialty societies:
  American Astronomical Society (AAS – OSU CUWiP contributor), Materials Research Society (MRS), IEEE, Optical Society of America, AAPM,
What can a professional organization do for you?

• Scholarship and fellowship opportunities
• Literature and articles relevant to you (science, issues, news): Physics Today, SPS Observer, APS Vector
• Conferences (UG events, travel grants)
• Resources (SPS Careers Toolbox, APS/AIP jobs portfolio)
• Extended professional network
• Your opportunity to shape your field
• Student membership is cheap (about $25/year)
Why join the Society of Physics Students?

- Support and Encouragement!
  - Membership in **two** AIP member societies (plus NSBP, NSHP)
  - Scholarships
  - Community outreach programs
  - Awards for student research
  - Grants for presenting at or reporting on professional meetings
  - Recognition of outstanding faculty advisors
  - Summer internship programs

All this for $24 a year!!!
http://membership.spsnational.org/
Entrepreneurship

• If you do it for a company, you might be able to do it for yourself!
• Look for graduate programs that foster entrepreneurial activities
• Take some classes in writing business plans and basic business strategy while you are an undergraduate
American Institute of Physics Statistics

- Find out about salaries, demographics, *etc.* in physics
- Knowledge is power
- Who has hired in your area?
- Salary information
- Graduate schools
- AIP Statistical Research Center

[https://www.aip.org/statistics](https://www.aip.org/statistics)
POLL QUESTION

In 2012, there were 1374 women faculty members in US physics/astro departments. How many were African American? Hispanic?

A. 30-39
B. 40-49
C. 50-99
D. 100-300
E. >300
Who is hiring?

“Non-traditional” careers

• Science policy
• Science journalism
• Law, especially patent and intellectual property law (IP)
• Finance
• Consulting
• http://www.poplarware.com/es/personal/leave_physics_possibilities
• https://www.aps.org/careers/physicists/profiles/
Traditional careers (I)

• Research & teaching – academic institution
• Research – academic institution
• Research – national laboratory
• Teaching – K-12, Community College, 4-year College, University
Traditional careers (II)

- Research & development – private sector
- Management – private sector
- Technical track – private sector
- Technical support – private sector, national laboratory, university
- Technical sales – private sector
- Software, modeling (technical, finance, …)
SPS CAREER RESOURCES

❖ SPS Jobs (http://jobs.spsnational.org/)
  – Job listings focusing on those with bachelor’s degrees
  – The new home for summer research/internship opportunities

❖ Career Toolbox (http://www.spsnational.org/careerstoolbox/)
  – An incredible resource!
  – Helps physics majors identify resume-worthy skills from experiences, prepare for job search/interview process, identify key words in job titles, ...
  – Info sheet available for career service office; versions for parents and guidance counselors planned
POLL QUESTION
• What percentage of physics graduates go to graduate school in physics?

A. 10%
B. 25%
C. 35%
D. 50%
E. 70%

http://www.aip.org/statistics
Important facts.

• FACT: At graduation, physics bachelors students have OPTIONS.
• FACT: Many physics students don't know this.
• FACT: Many physics faculty members don't know this.
• FACT: Many career services personnel don't know this.
• FACT: You now know this.

• FACT: Most of us may not know how to effectively take advantage of these facts on behalf of our students
Eight Important Tools

- Common Job Titles
- Informational Interviewing
- Networking
- Knowledge & Skills assessment
- Effective job searching
- Effective resume writing
- A cover letter that gets an interview
- Interviewing with confidence
Career advice

• Think about your career (plan, but plan to change your plan, too!)

• Most things benefit from planning

• Make strategic choices, open new doors

• APS profiles, jobs guide, webinars

• AIP jobs toolkit & things therein

• Network, network, network ...