Second Graduate Education in Physics Conference
Panel Session 1: Preparation for Non-Academic Careers

Panelists: Kathy Prestridge, Los Alamos National Laboratory; Zelda Gills, Lockheed Martin; Alex Panchula, First Solar

Moderator: Larry Woolf, General Atomics Aeronautical Systems, Inc.

Scribe 1 (Andrea Palorenek) Notes

Kathy Prestridge, Los Alamos Lab:
Looks for interdisciplinary skills, i.e. collaborating with theory, experiment, simulations
Writing great technical or progress reports, great “elevator speeches”, communication skills

Zelda Gills, Lockheed Martin – Georgia Tech:
“If I become a physicist, I can do anything.”
Learn to talk about what you do in a way that is interesting in anyone

Alex Panchula, - First Solar:
Having a PhD in physics gives leverage, level of respect among colleagues.
Typical physics – related job requirements are hardware design, data analysis, math concepts. Train physicists for interviews, to demonstrate that a PhD prepared him/her to pick up any skill. Skills needed for graduate students – should learn common programming languages, statistics, interpersonal skills, writing and presentation skills.

What do you recommend changing about the typical physics curriculum to prepare students for jobs in industry?
Soft skills are neglected, not technical skills
Seminars with scientists in industry - disconnect
Joint projects with engineers
How to monetize their intellectual property
Experience with writing grants
Capable of leading a project, creative, has new ideas

How to convince faculty of the importance of seminars for students?
Stress that non-academic jobs are not a sign of failure

How to prepare for small companies?
Startups are in key areas in US, game of taking a chance with 10% likelihood of survival in 6 years – like starting a lab with a junior faculty
ReadyForce – assistance with connecting undergrads and grad students with startups
Technology transfer programs

How to change culture of pursuing academic jobs?
Have graduates of respective programs give talks
Arrogant attitude about “pure subject” not discussing applications of subject within classes

**Is the climate better for women and minorities?**
Determined by manager – bad manager = bad experience

**Starting salary?**
Postdocs make $70,000/year or $100,000/year (unnamed or named), Assistant professors $60 to 70k/year (Resources available at AIP Statistical Research)

Time flexibility despite time requirements
Unwritten expectations for acquiring tenure

**Consensus:**
Interdisciplinary experiences
Writing a better CV
Project management skills
Soft skills
Students will give you a return on your investment, if you allow them to grow through opportunities in industry

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**Scribe 2 (Deanna Ratnikova) Notes**

5 minute intros: Kathy Prestridge – Los Alamos National Lab
Zelda Gills – Lockheed Martin
Alex Panchula – First Solar

**Kathy Prestridge:**
Very classical education in fluid mechanics – very academic atmosphere although some applied work
Halliday & Resnick in 20 weeks – weed out course at Princeton
Look for: T-shaped
See very good technical skills – not a problem
Interdisciplinary experience important: expt/theory; simulation
Agility – apply old knowledge to new situations
Mentoring is very important
US Citizens for jobs at Los Alamos a requirement
Communicate at appropriate audience level
Elevator speech (1 minute to say what you do and why it is important; technical and progress reports to funding agency
Project management and organizational skills
“I have great communication skills – I think I’ll become a physicist”
Teamwork – did not hire “superstar” jerk who showboated
Team unity is important
Team respect for others
Know most will not have project management experience
Strategic thinkers – if only details of research, not enough
Social nature of science underappreciated
Agile, thinking outside the box, social skills

**Zelda Gills:**
Principal who said could be #1 in state; stolen from engineering department – if became physicist could do anything; coach of many. Physicist who has done sales and marketing…
Women connect with a passion – my passions are:
  - People: in defense industry – helping people do their jobs better; people come home whole.
  - Conceptualizing, integrating, packaging, marketing
Preparation: grad school; I can’t do everything by myself; need to have a team
Written and oral communication
Advisor who was open to other experiences
Competitive spirit and endurance
Larry Woolf’s article spot on

**Alex Panchula:**
Team looks at large amounts of data; model how environment interacts with solar panels and how solar panels interact with environment
Middle manager; started as individual scientist
T-shaped scientist: cross functional teams; customer interactions
Preparing for industry: grad students – right angle and trajectory path is up to them
8 people in startup:
  - HW design-electronics and deep diving into analysis – data driven
  - Math concepts (banking!)
No direct experience – do you think he/she can learn it?
Physicists are rare finds in industry – marketing problem
Physicists need to know how to interview – don’t use physics shorthand
Don’t focus on what did, but how did it
What wish had been exposed to?
  - Software
  - Programming, especially languages
  - Statistics
  - Business methods
Senior grad students should be put in charge of 1st year students – lots of OJT
Communication – interpersonal skills are more important in industry than in lab
Concise writing and presentation skills
Larry: anecdote from UCSD March Meeting relayed by another physicist who worked at Hitachi: “What are you doing here; this meeting is for physicists”
Need to eliminate mindset that industry is not appropriate for physicists

Kathy: issues with education are not necessarily content – no problem with technical knowledge but soft skills need improvement

Alex: echo that; set up summer with people from industry to expose students; most physicists come in through side door; have to have interdisciplinary experience; more joint with engineering

Zelda: remember end goal of industry – make and monetize intellectual property; resources to power ideas; write grants and proposals (“capture”); convince customer in 10 seconds

Larry: show responsibility that you can lead a project; you are responsible for all aspects of getting project done; generate new business

Faculty discourage students from attending these things

Kathy: culture of failure if don’t become an academic

How do we help students prepare for where most jobs are? (small companies!)

~2500 postdocs at Los Alamos

Alex: ~50/50 large vs. small companies in US

Key about startups: location and success has strong correlation; churn of ideas
Natural fits with physicists – materials…
Trigger plunge – temperament issue
No support – grad student who helped junior faculty start a lab is a good prep

Megan: spent time walking around undergraduate job fairs, asked would you hire a physicist? Would hire a physics PhD in an instant; oh, I actually have a physics PhD – but busy

“Ready force” – go for undergrad and grad to go to startups; trying to get them to go to APS March Meeting

Culture of failure if not academic: What is logistic step to change that?
Bring in industrial speakers; job fairs; have graduates come back to talk with students

Univ of Penn:
Prevailing arrogant attitude about teaching courses.
Nobody makes an effort to teach stat mech in a way that physicists and chemists and engineers can do together. Make our physics courses amenable and open to other students; can go to other departments

Student from Univ of Chicago:
Work in teams with other departments (business, psychology…)
Try to incorporate into courses things that can be applied outside academia
Ask for advice and mentoring for these students
If others see graduates getting jobs, this will improve retention and morale, too

Larry:
Colloquia – industrial people from more than standard big companies
Get speakers from B school to talk about technical program management
Exposure to industrial programs

Physics departments shared support

Tech transfer infrastructure setup – west coast startups and Si Valley

MIT something similar; Georgia Tech, GTRI

Timelines are 3 months in startups; work ethic
From grad school is good prep

Kathy: When you write letters of recommendation, say what the student actually did (i.e., built lab from scratch; what skills they have)

Alex: most professors have not had to look for a job; have people go find a job once every 5 years

Charles Lui (CUNY): Slightly taboo question: is it better for woman/minority; do you actually make more money?

9 month salary is ~$60-70k
LANL: $70k to $100k for postdocs
$105-110 for starting scientists

Is it better for women/minorities? Probably, if you don’t work for a jerk

Two body problems, maybe labs a bit behind

We have much more time flexibility – do have to meet deliverables, but how do it is up to you
Zelda: Also look at unwritten expectations for tenure. $/hr less than garbage man would make in academic; industry, many times higher

Alice (Bell Labs):
Nobody asks what your degree is in; huge variety of activities
Attitude adjustment – a very supportive environment, total flexibility
Should make it win-win
Most faculty don’t know how to explain research in way that’s interesting to me

Conclusions:

Kathy Prestridge
Interdisciplinary
Communication skills
Writing a resume
Management skills
Soft skills

Alex Panchula
Bring students from industry back to talk
Non-academic colloquia

Zelda Gills
If allow students to grow, will give you return on investment
You have to develop relationships with industry to exploit $ liquidity that’s there
Summer projects with industry

Larry Woolf
Grad students are already project managers for their project
Make a slight tweak and do it for real
Budgets, schedules/milestones
Include them in the defining of the project

Crystal Bailey
Statistics on AIP website
Job fair at March Meeting
Workshop on how to apply for industry jobs