

Running a Research Group

Being a CEO, COO, CTO and HR officer

Greg Tew - My Experience

- My own PhD experience
 - Little mentoring from PhD advisor
 - Outstanding focus on science
 - One group management practices
 - Outstanding peers, colleagues
- My postdoctoral Experience
 - Outstanding focus on science
 - More supportive, but still limited mentoring
 - Limited interactions with colleagues

On August 25th, 2001, I was a postdoc
On September 1st, 2001, I was the boss!

Marketing CEO

You are new and few people know how you are

- Attend major meetings and present your science
 - Always make sure this is excellent
 - Network
 - Be seen

Group Management

How you run your group initially may be different from how you do it 5 years, 10 years later

Group vs. sub-group vs. individual meetings

Papers, Presentations, Proposals

How to handle this continuing (expanding) work load

- Early on, this was more manageable
- At about 5 years, this was a huge drain on my time
- Modified how we prepare papers
 - This impact student presentations
- Proposals—more than 1 years between submission and money (when successful on the first try)

Research Group 101

Recruiting and Maintaining Your Team

Paula Hammond - My Experience:

- PhD: Small Group (6-8 people), Highly Approachable Advisor
- Postdoc: Large Group (44 people), Busy, Less Available Advisor
- My Group – changing sizes, adjusting along the way

Getting Started – Recruiting your first members

- Look for a Postdoc if you can afford one – find someone who is good, fast, and capable
- Learn the “rules” – written and unwritten - for grad student recruitment:
 - Pre-recruitment necessary at your Institution?
 - Limit on # of 1st years?
 - Do the big guys get all the students?
 - Is it OK to recruit outside your department?
 - What are your contemporaries doing to get the best students?
 - Get on the recruitment bandwagon as early as possible; before your arrival can be ideal

Student Recruitment

Goal: increasing your choices so that you can be picky

- Get on the Admissions Committee
- Be present at all recruiting events, increase visibility among 1st years
- Request and read the applications of 1st years ahead of time
 - Note that Good = good in lab (#1) and good enough in academics to pass quals
 - The student with just OK grades but a great driven attitude and enthusiasm could become your best student.
- Ask senior faculty and contemporaries in your field about good students ahead of time.
- Teaching a first year core grad course or elective increases visibility.
- When choosing the student, do check with their instructors on how they are doing during the term.
- When choosing students, do find out about their lab track record.

Postdoc Recruitment

- Do find funds for a Postdoc to help you startup
- Network with senior colleagues to find out about potential postdocs
- Make sure your project and your plan is exciting and provides the key elements needed for a good postdoc planning for his career.
- Talk about future career with the postdoc, understand what he/she needs.
- Discuss any fellowships, etc., the person can apply for where relevant.
- Ability to have data, present at meetings, get papers is key to a good postdoc

BEWARE

- Students or postdocs who have a pessimistic life view.
- The very smart student with the *REALLY* laid-back attitude.
- If you are known as being 'nice', do look out for students who are looking for 'a nice and safe haven' but don't want to be pushed.
- Students who seem to have disruptive social behavior (ask your current group members).
- Postdocs who are on their 2nd, 3rd or 4th postdoc (unless it is field or economy appropriate).
- If a good person cannot be found, try not to make a desperate selection – bad people burn time, money, and some of your best ideas!

Maintaining the Group

- Be clear about side-projects vs. main projects, spontaneous collaborations
- Avoid destructive in-group rivalry -each individual with a project that is uniquely defined.
- Plan projects so that they are synergistic with each other as your group grows.
- Emphasize that students and postdocs work together as a team.
- Assign responsibilities to group members – they like to feel vested in their team

Management:

- Plan some individual contact with each group member. Depends wildly on management style, but needs to be consistent and reasonably predictable no matter what.
- Keep your group members connected as much as possible with others who can help them – make sure they feel enabled and can easily network with others on and off campus. Avoid intellectual, social (and instrument/equipment!) isolation.
- Build group camaraderie – plan a group outing or help shape a group tradition.
- Manage your group size with thought as best possible– there can be such a thing as growing too big too soon, both in projects and scope.

Ken Carter – My Experience

- My own PhD experience
 - Little interaction with peers (except one great PD)
 - Few group management practices
- The IBM Research Years (1991-2004)
 - Technical Group meetings
 - Little technical “mentoring”
 - Small, very independent groups
 - IBM Goal focused, but highly competitive (\$\$)
 - Outstanding peers, excellent hires and retention
- UMass Years (2004-2011)
 - Still seeking a better management system
 - Very wide distribution of “excellence”
 - Extremely diversified research areas

Monitoring Activities of Leading Research Group in Your Field

- Identify leading research groups in your field
- Find out their recent research focus
- Read their papers
- Look to see what conferences they attend

Nurturing Good Taste

There are many mediocre papers published

- Do not waste time by reading every poor-quality paper

Read Selectively

- Highly cited papers and papers from first-tier top journals and top-ranked conference

Classify Papers

- Type A: Comprehend 80% (main idea, solution method and main results)
- Type B: Comprehend 50% (idea & results)
- Type C: Comprehend 20% (only introduction)

Learn to appreciate good papers and criticize poor papers

Group Dynamics

Large group can be good

- More resourceful in terms of interaction (now) and networking (future)

Small groups can be good

- Easier to manage
- More mentoring, interaction and time

Senior students can be very helpful to junior students

- Experience sharing & encouragements
- More tolerant to mistakes
- More accessible

Good versus bad environments

Each group has its own culture

- Building a good group culture is rewarding
- Word will spread if you build a bad culture
- You can be a poor manager, but if so you have to be very, very good at the science

Guidance and Feedback

Role of Advisor

- Help with decision on research topic selection
- Set the research standard
- Help when students get stuck
 - Find out why
 - Re-directing
- Feedback on research results
 - Positive and negative feedback
- Help in oral presentation skills and written reports

Setting Goals, Planning and Execution

- Long-term goals (6-12 months) are set up
 - prospectus, ORP, defense exams
 - Conference/journal papers due dates
 - Deliverables for sponsored projects
- Milestones are established and revised
 - Schedules are set according to the goals
 - Periodic review of progress towards to these goals
 - Milestones revision may be needed

The Advisor's Role

- Multiple Roles
 - Experienced lab scientist
 - Teacher
 - Parent Figure
 - Friend
 - Cheerleader
 - Moral Compass
- Consider other Subjects to “teach”
 - How to do research
 - How to find a job
 - Technology trends
 - Observations from trips & conferences
 - How to handle stress and disappointment

Final Thoughts

Build a group culture

- Consistency, transparency, honesty, fairness
- Encouragement yet with discipline
- Don't be physically or emotionally abusive

Demand determination and commitment

- Lead by example
- Reward students/PDs that are leaders
- Breed a “can-do” group atmosphere
- Deal with trouble students

Extra Slides

Oral Presentation

- Preparation of the ppt file
- Logical flow of motivation/ideas/results
- Fluent English language capability
- Practice, practice and practice

Writing

- Critical to the sale and dissemination of your ideas/results
- Paper organization
- Proper arrangement of texts, figures and tables
- Stages of manuscript preparation
 1. Detailed outline written and approved
 2. First draft writing
 3. Group review
 4. 1st reading by advisor
 5. Generation of final draft

Report and Feedback (1)

- Weekly report system
- The origin of the weekly report system
- The practice
 - Due every Monday
 - Read and evaluate on Friday afternoon during subgroup meetings
 - A synchronization and diagnosis tool

Report and Feedback (2)

- Weekly report format
 - Tasks achieved last week
 - Tasks to be done next week
 - Feedback and interaction
 - Reports
 - Milestones

Being a Parent and Psychologist

- Like it or not, you become a “head-of-family” figure
 - Remember, many students are still not really adults in that they have four years of college experience and not much else.
 - Some students need more emotional support than others
 - Some need professional help
- You need to understand and determine your role
 - Be supportive
 - Do not over-step your role
 - Draw boundaries
 - Seek resources when serious problems arise or if you think there is something wrong.

Learning Management Skills

Skills required but rarely taught:

- People management
- Financial management and budgeting
- Sales and marketing

Management Skills Specifics:

- Resource management
 - time, internet and search tools, e-mails, meetings, students, peers, money, time, time, time
- Project Management
 - Importance vs urgency
- Good planning is needed to reach objectives and adequately use resources

Sales and Marketing 101

Sales is essentially related to your presentation skills and networking

- Treat your work with enthusiasm!
- Paper writing (take it seriously)
- Oral presentation (even poster presentation)
- Proposal writing
- Making friends and building networks

Marketing skills

- Finding new opportunities in funding and research directions
- Resources are limited; always seek the possible biggest possible impact

Collaborations

Faculty (Local and external)

Science and Engineering Research Centers

Industrial partners

Weekly report & conference calls

Key driving force to different new research areas

Motivation

Why should I do PhD?

- Internal drive
 - Research interest (curiosity, sense of achievement/fulfillment)
 - Strong ambition (self-expectation)
- External factors
 - Job / Career
 - Degree and diploma
 - Peer pressure (family, etc.)
 - Make the world better

Literature Survey

Use tools

- Trace backward
 - Find highly cited review paper and study the reference list
- Trace forward
 - Use ISI, Google scholar, or similar tools to find papers that cite the current work

Proactive vs. passive reading

- Reading with a critical attitude
- Reading according to your own agenda
- Reading between lines (not only what was said but what was not said)

Form a study group

Group Meetings

- Weekly Full Group Meeting
 - Tried different formats:
 - One student giving major talk on her research
 - One student give a report on recent paper
 - Roundtable research summaries
 - Group Business
- Subgroup Meetings
 - Works well if you have a wide diversity of projects
 - Format and frequency varies (1 per week or 2 per month)
- Focus on Presentation skills
- Train group on how to critically evaluate work of peers
- Help ensure students are making research progress