Guiding Principles of Good Lab Management for the New Investigator

At the Helm: Avoiding Management Mistakes*

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How do you get the best from your personnel?

Cynthia J. Jameson
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Management mistake #1. Some PIs ignore tenure requirements for several years in order to get research under their belt--and then they have to scramble.*

- Plan for tenure. Use a 'Planning for tenure timeline' (cjj)

*Kathy Barker

Management mistake #2. Some PIs let the lab assume its own shape and style.

as soon as you move into your new lab begin to build a framework, philosophical and practical, for the lab to grow into.

Develop your leadership and management style

- create a **vision** for your lab

- create a **mission** statement

- develop a written five year **plan**
  – obtain feedback from senior faculty
  – assess progress and update often

- establish a lab **culture**

- build an effective **team**

know what kind of lab culture you want:

- **Accountability:** state up front how authorships are decided, make sure you know how much money is being spent, decide on a format for lab notebooks & check everyone's notebooks regularly

- **Communication:** lab meetings are effective and well-attended, and everyone contributes; tell students that honesty, integrity, and courtesy are an indispensable part of your lab philosophy

Imprint your scientific style

- Once you have hired someone, work closely with that person until you are sure he or she is doing science the way you want your science done and will continue doing it that way even when you aren't looking over his or her shoulder. You want to be able to trust and believe that person's data completely; furthermore, you want that person's work to bear the imprint of your scientific style. So **teach** everything, from choosing and following a protocol to deciding how many repetitions are needed within your system, for a valid result. **Teach** not just techniques, but how to think like a scientist and remain ethical, while also being politically savvy. **Teach** within the organizational and philosophical framework you've decided you want for your lab.

Cultivate the idea of "a team with a common goal"

- More productive than the sum of individual members

- Personnel contribute more when made to feel part of a team that relies on their contributions

- Personnel feel valued when their input is sought, when discoveries are celebrated and they are fully included

- Person's personal and professional goals are consistent with their role in the team

PI's role in the team

1. Develop a research mission that is clear to all members

2. Make expectations clear orally and in hand-outs: e.g., working hours, how notebooks are maintained, policies regarding attendance at scientific meetings, who cleans up, who orders supplies; as a team decide who will do which tasks and when

3. Schedule strategy sessions regularly to catalyze idea sharing and to develop a plan of attack

4. Recruit: Identify and respond to talents and capabilities early; each is unique; match talents with projects

5. Hold regular lab meetings to promote enhanced communication and oversee progress: whole group, subgroups on specific projects, individually

6. Discuss authorships at the beginning of a study, esp for collaborations between labs

7. Discuss personal and professional goals of members and provide help to achieve them

8. Manage conflicts within the team
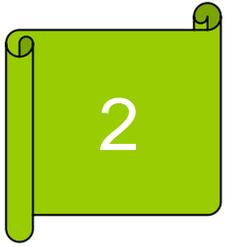
2 Establish reasonable policies, communicate them clearly, and stick to them.

- Hand-out lab policies. (see example: Drezek_Lab_Expectations.doc)
- MOUs (see example: Drezek Lab Certifications.doc)

Rebekah Drezek
BioE Rice U

Make rules that make sense

- Meeting attendance policy, attendance expectations, designation of common areas, safety regulations, rotating lab jobs, reagent-reordering procedures, and keeping track of stocks

Management mistake #3. Some PIs assume all people they hire will be motivated and competent.

- Understand yourself and your needs, and know what traits are absolutely necessary and what kind of person you wouldn't choose even if they were the last one on Earth.

- many experienced PIs have figured out that it is a good idea to **hire for character**, not for technical expertise. Anyone who is reasonably intelligent can learn a technique, but honesty, good humor, and the ability to get along with difficult people will go much further in the long term.

Recruiting graduate students into your team

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- The best predictor of future performance is past performance. Get reference letters, and phone every one! Did she get along with others in the lab? Did he understand what the experiments were about? Would you hire her again?

- Ask the questions that will give you the answers that matter to you. Is he dependable; can he troubleshoot, is she organized; can she work independently?
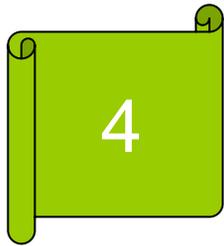
1. Create an informative, welcoming, and transparent website*

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- **Start with a general statement and demos which makes almost any student in your field aware of the importance and innovation of your research.**
- **Make sure it is easy to find faculty and student interests and recent publications.**
- **Include—no, <u>feature</u>—graduate student accomplishments (e.g., publications, awards).**
- **Provide stories about current students and alumni.**
- **Talk about funding available or potentially available.**

*Graduate Student Recruiting
Les Atlas
Department of Electrical Engineering, UWashington

2. Respond **quickly and personally** to inquiries from all top-notch students and also be proactive

- **Students expect a response within 24 hours of their email or phone call.**
- **A personal response from faculty PI is important here. Yet other grad students can "chime in."**
- **Your current graduate students are your best "sales" people. Involve them in the recruitment process.**
- **Don't wait for applications to be complete before you start reviewing them to look for strong candidates.**
  - When you find excellent students whose applications are not complete, contact them to indicate your interest in their candidacy and encourage them to complete the application.

3. Invite potential students for a recruitment visit: treat it like faculty recruiting visits

- Bring your top recruits to campus at the same time—this builds a cohort feeling
- Involve faculty and graduate students in the recruitment visit. Showcase graduate student achievements.
- Offer a well-organized and full mix of social and academic activities (e.g., dinner at a faculty member's home, regional fun things).
- Provide potential students opportunity to meet with students and faculty in other disciplines, either through your own interdisciplinary initiatives or drawing on the various graduate student associations.
- Follow up with emails and phone calls when the student returns home tell them you enjoyed meeting them and hope they will decide to come to UIC. Ask if there are any further questions you can answer.

4. Invite potential students for a recruitment visit (continued)

Fill their days up, for example:

Thursday, March 30
8:30 - 9:00 Gathering, continental breakfast, distribution of appointment schedules
9:00 - 10:00 Welcome, introductions, dept overview, info from the GSA
10:00 - 11:00 Poster session with current grad students
11:00 - 12:00 Individual meetings with faculty
12:00 - 1:30 Lunch and post-lunch Q&A with current graduate students
1:30 - 5:00 Individual meetings with faculty
6:30 Spaghetti dinner at Professor John Xxxx's house

Friday, March 31
9:00 - 10:30 Individual meetings with faculty
10:30 - 12:00 Research Labs Open House
12:00 - 1:30 Lunch – on your own, free to explore
1:30 - 5:00 Individual meetings with faculty
5:00 Buffet with faculty and grad students
evening Nightlife with current grad students, or time for personal agendas

Saturday, April 1
10:00 Current graduate students will coordinate Chicago sight-seeing.

5. Do swaps with colleagues at other departments

- **For top departments: "I'll send you my best undergraduates if you send me yours."**

- **Do consider less-known undergraduate programs:**
  - Great graduate students and, ultimately, famous people can come from less prestigious undergraduate programs.
  - Get to know faculty at these schools.
  - The absolutely top undergraduate students at some seemingly lesser-quality departments can become future industry or academic leaders!

- **This concept needs good communications with other faculty on admissions committees.**

6.Be ultra-careful about selectivity

- **Forget the expectation of absolute top grades at top departments.**
    - That system can be gamed
    - But still expect fairly high GPAs
- **Forget GRE's since they also can be gamed**
    - But still expect some reasonably high threshold.
- **Usually trust reference letters, but only if they include substantive examples.**
- **Important: They show interest in your area or at least are curious about it, if they come from an initially different area.**
    - Most BS 's don't know what they want to specialize in.
- **Predictors of future success:**
    1. Creativity in their statement of interest.
    2. Phone questions:
        - Want to become a faculty member at a top school?
        - Want to take risks in your research?

7. Instill confidence in the potential recruit

- **Discuss the statistics for your department's Qualifying, Prelims, and Thesis defense.**
- **Comment on the positives you saw in the students' statements of interests and academic record.**
  - Most important, point out what is unusual or special.
- **<u>Excitement in them builds excitement in you.</u>**
  - Share this with your current graduate students .
- **The visitors potential impact on your research and the field in general would be high if she comes here.**
  - Stress his or her impact 1st, and how good we are 2nd.

8. Instill confidence in future academic careers

- **Informal poll taken among PhD students interested in possible faculty positions:**
  - **The #1 worry, by far, is the difficulty of the tenure system!**
  - **Some possible things to help this specific problem:**
    1. Relate the successes from your lab.
    2. Tell them your own experience.
    3. Most departments hire 1 faculty member for each for tenure-track positions
  - **The #2 worry, is the difficulty of getting funding.**
  - **Some possible things to help this specific problem:**
    1. Tell them your own experiences, good and bad.
    2. Relate how they will gain proposal writing experience in your lab.

- **we need to offer more personal attention from faculty and a stronger sense of community than the top-name schools.**

If a student chooses to join your lab

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- Quickly let them know your expectations, e.g.
  - I might suggest problems and solutions, but
    1. I intentionally start with very difficult problems
    2. But I strongly encourage them to re-define the problems and find solutions which I would not have considered.
    3. Everyone in the lab has to do their share of the more mundane tasks.
- Strongly encourage cooperation with others in the lab. There is no penalty for joint contributions!
  - Keeping ideas secret so they won't be stolen is usually inappropriate and a bad indicator of future success.

Guiding Observations

◆ **Every student is different**

◆ **There is not a single correct management style**

◆ **When in doubt ask: What is best for the student?**

Career Planning for Prospective Faculty AIChE Annual Meeting Nov. 12, 2006
Geoffrey Prentice
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Reasons Grad Students Fail

◆ **Project too difficult or unmanageable**

◆ **Student lost interest in topic**

◆ **Student isolation**

◆ **Poor planning and project management**

◆ **Writing the dissertation**
  - ◆ Few problems if turn in parts while still doing research

◆ **Personal problems: Money is #1**

◆ **Inadequate or no supervision**
  (22% of Graduate Students in survey)

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Student Project Definition
A Four-Step Process

Step One: Select Student

◆ Keep a sharp eye in the <u>classroom</u>

◆ Participate in the <u>recruiting and application review</u> process

◆ Impress on the student that this is the most important decision they will make in graduate school!

Student Project Definition
A Four-Step Process

Step Two: Involve the student in defining the project. It is a periodic process.

◆ Teach student how to define research problem

◆ Scientific method

◆ Synthesis of literature

◆ Grant/contract requirements must be met

◆ Funded project likely more successful (peer reviewed, long term support)

Student Project Definition
A Four-Step Process

Step Three: Incorporate early milestones

◆ e.g., specific classes to take, a report, first paper or presentation, a piece of equipment designed, literature review, hypotheses / broad objectives, etc.

◆ Establish a 2-way "probationary" period

◆ Establish a timeline for project

◆ Require regular progress reports

Student Project Definition
A Four-Step Process

Step Four: Establish the research committee

◆ Help the student choose the committee, impressing on them the purpose of a research committee

◆ Have the student present her/his hypotheses (depending upon department rules), objectives, and any initial results to her/his committee within the first year.

Student Project Definition

◆ **Value independent thinking**

- Include open-ended component(s)
- Have them involved in document definition
  (e.g., thesis outline, submit fellowship application – often requires career plan
- For every problem they encounter in the lab, I encourage them to FIRST think of at least 3 ways to solve that problem before they come to me for "answers."

◆ **Encourage project "ownership"**

- Have student be responsible for keeping supplies needed for her/his project in stock

◆ **Define role in group**

- Often a friction point
- Important to not only show how their work overlaps with other students but also to give each student a task (e.g., SOPs, lab orders, waste declaration)

Authorship

Disputes over authorship and project ownership arise in every laboratory, but if everyone knows the rules ahead of time, and if those rules are enforced consistently, these disputes are much more easily dealt with.

Journals and institutions have established standards for authorship

Harvard Medical School:

http://www.hms.harvard.edu/integrity/authorship.html

Surgery Journal Authorship Criteria concensus of 30 journals:

http://www.annalssurgicaloncology.org/cgi/content/full/13/6/757

ICMJE* criteria for authorship requires intellectual participation in *all 3*:

- any aspect of conception and design, acquisition of data, or analysis and interpretation of data

- any part of drafting the article or revising it critically for important intellectual content

- manuscript final version approval

*International Committee of Medical Journal Editors, 500 biomedical journals

Authorship Guidelines

- **Everyone who is listed as an author should have made a <u>substantial, direct, intellectual</u> contribution to the work. For example they should have contributed to the conception, design, analysis and/or interpretation of data. Honorary or guest authorship is <u>not</u> acceptable. Acquisition of funding, provision of technical services, patients, or materials, while they may be essential to the work, are not in themselves sufficient contributions to justify authorship.**

- **Everyone who has made substantial intellectual contributions to the work should be an author. Everyone who has made other substantial contributions should be acknowledged.**

- **When research is done by teams whose members are highly specialized, individual's contributions and responsibility may be limited to specific aspects of the work.**

- **All authors should participate in writing the manuscript by reviewing drafts and approving the final version.**

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establish the rules early

- Research teams should discuss authorship issues frankly early in the course of their work together.

- Disputes over authorship are best settled at the local level by the authors themselves or the laboratory chief.

- Laboratories should post, and also include in their procedure manuals, authorship rules statement and a description of their own customary ways of deciding who should be an author and the order in which they are listed. They should include authorship policies in their orientation of new members.

- Authorship should be a component of the research ethics training that is required for all members of a lab.

primary/corresponding author

- One author should take primary responsibility for the work as a whole even if he or she does not have an in-depth understanding of every part of the work.

- This primary author should assure that all authors meet basic standards for authorship and should prepare a concise, written description of their contributions to the work, which has been approved by all authors. This record should remain with the sponsoring department. Some journals require, at the time of manuscript submission, that corresponding authors should describe the individual contributions of each named author to the work they have submitted.

order of authorship

- Promotion committees, granting agencies, readers, and others who seek to understand how individual authors have contributed to the work should not read into <u>order</u> of authorship their own meaning, which may not be shared by the authors themselves.

- The authors should decide the order of authorship together.

- Authors should specify in their manuscript a description of the contributions of each author and how they have assigned the order in which they are listed so that readers can interpret their roles correctly.

- The primary author should prepare a concise, written description of how order of authorship was decided.

Group Meetings

◆ **Periodic group meetings are helpful**

 ♦ **Presentations, guests, lectures, paper reviews, book chapters, special events**

 ♦ **Meet with other groups occasionally**

 ♦ **Keep it technical**

Individual Meetings

◆ **Establish mechanism for regular meetings**

◆ **Every student is different**

  ◆ **Identify strengths, weaknesses**

  ◆ **Academic children**

◆ **Clearly convey your expectations**

Faculty Role

◆ **You are the research <u>advisor</u> not fellow student**
  - ◆ Maintain professional relationship
  - ◆ Thesis is authored by 1 person

◆ **You are role model, academic counselor, consultant, sounding board, evaluator, supporter, editor, agent**

◆ **Establish traditions / build pride**
  - ◆ Hardbound dissertation, dinner, pedigree chart, . . .
  - ◆ Maintain contact

Ideal Advisor

◆ **Advisor active in research**

◆ **Has regular meetings with Grad Students**

◆ **Creates a research climate that encourages Graduate Students to have independent ideas**

◆ **Expects quality**

◆ **Model for ethical behavior**

◆ **Want graduates to *almost* think they did research & thesis by themselves**

Graduate Student Evolution

◆ GS like warm, *structured* advisors

◆ 1st year Grad Students want to develop a personal relationship with advisor

◆ 2nd & 3rd year Grad Studetns want expertise and availability

◆ Grad Students want advisor to adjust to their growing maturity

◆ In US, *laissez-faire* often interpreted as neglect - - particularly by international Grad Students

Research Advisor Attitude

- ◆ **Advising is a form of teaching.**

- ◆ **Advisors need to remember that student's growth is more important than research. Do what is best for the student at all times.**

    Kant's imperative: Act so that you treat human beings always as ends and never only as means. Graduate students deserve dignity and respect.

- ◆ **The best thing for the Grad Student may not be what the Grad Student wants.**

    - ◆ **Thus, there may be periods when the Grad Student is unhappy.**

    - ◆ **Advisors can discuss reasons for their behavior.**

Professors as Advisors

◆ **A few are effective with all students, most are effective with some, and a few are incapable of advising anyone.**

◆ **Some professors have problems over and over.**

◆ **Some professors are better with undergraduate and Masters students, and others are better with PhD students.**

◆ **Professors improve with experience.**

◆ **Departments: Track performance of PhD candidates**

Student Evaluation and Feedback

◆ Develop an evaluation process

   ❖ Examples: Formal process (e.g., your University may have a process), biweekly meetings, group meetings

◆ Build in methods to detect problems early

   ❖ Sample writing, timelines, independence, professionalism, ...

◆ It is never inappropriate to send words of "thank you," "job well done," and "good luck" or to likewise let them know that you are expecting better things from them!

◆ Students are usually better than you think!!!

   ❖ Don't be afraid to challenge them!!!

Student Evaluation and Feedback

◆ **Utilize peer group**

  ❖ **Feedback on presentations, research plan, writing**

◆ **Return material in a timely manner**

◆ **Seek advice**

  ❖ **Counselors, other faculty, international office, ...**

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Placement and Professional Development

Help students determine career goals

◆ **Academics: Research, Service, and Teaching**

❖ Expose them to your world in a positive way!

❖ Examples: meaningful TA, involve in writing proposals, direct undergraduates, have them attend key technical meetings (have them prepare business cards)

Placement and Professional Development

Help students determine career goals

◆ **Off-campus experience**

　❖ Take them on visits to industrial, consulting, and governmental facilities, host visitors from these facilities, choose someone who works in one of these locations as an external committee member, etc.

◆ **Discuss pros and cons of each career choice**

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Placement and Professional Development

Help students prepare for placement

◆ **You have an obligation to assist student in obtaining a suitable position**

❖ **Put in the "leg work" for your student**
  - Network, letter, promote, attend right conference

❖ **Maintain contact lists** (industry friends, former students)

❖ **Expose them to the profession** - Include students in conference/session planning, encourage them to volunteer for their professional societies, participate in short courses, and other activities that may promote their interaction with professionals

❖ **Host Visitors**

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Placement and Professional Development

Help students prepare for placement

◆ Assist in presentation development, review resume and supporting documents

  ❖ Typical questions, talk with other students, observe faculty candidates, sample resumes

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Management mistake #4. Some PIs refuse to intervene in lab conflicts.
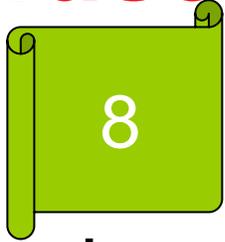
8   **conflict resolution**

- when personnel issues cause tension in the lab, it is part of your job to step in and deal with the situation or individual that is the source of the trouble.

- Indicators: marginalization of one or more lab members, changes in physical appearance or in personality of the people in the lab (acquaint yourself with signs of depression).

when a student is not working out

– If the fit isn't good, inform the student that you are happy to help them transition to other labs.

– If you start having some misgivings about a

   student, be clear about problems, and give them a

   chance to improve.

– **But if they don't or can't improve, counsel them out of your lab. 1 quarter is usually enough time for this assessment. The above is quite difficult to do, but dragging it out over time only makes the problem worse for all.**

– **Once in a while the difficult student is worth the trouble, but these cases are, in my experience, very rare.**

How to maintain continuity

Continuity

◆ **Overlap students**

  ❖ Have each student be responsible for training her / his successor

  ❖ Use a checklist of basic lab techniques they must first master

◆ **Technicians, research faculty useful**

Continuity

◆ **Make certain that the laboratory has teaching resources**

  ❖ Develop a notebook of SOPs. Have students write these.

  ❖ Keep copy of all equipment manuals locked up but available

  ❖ Have good methods books on hand

Continuity

◆ **Document programs, thesis is good repository**

◆ **Use lab books (good for IP too)**

◆ **Maintain contact with students after graduation**

Keep alumni on your website