Managing research and publishing papers

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Be prepared to succeed

- Most faculty succeed— it is therefore more important to make a contribution to the field than to just “look productive”
- Collaborate to move into new fields and to get new ideas/perspectives.
- Professors-- Learn how to have others work for you. You are a manager now.
The Power of 3

• 3 = Research, Teaching and Service
• 3 = number of courses you teach per year in the USA:
  – Typically at least one graduate course specifically aligned with your research interests
• Remember, research counts the most towards your professional success.
• 3 = number of topics for Research (limit yourself to just three!)
  – Area of your dissertation work
  – Area aligned with your dissertation work
  – Crazy idea(s) :
Using atomic force microscopy to understand bioadhesion

Particle transport in the subsurface

Effect of fluid environment on mass transfer to bacteria

Biofilm reactors (trickling filters)

Dissertation: mass transfer to microbial aggregates and biofilms

Aggregation rates in sheared reactors

Aggregate formation in the ocean

Fractal coagulation (of aggregates)

Bacterial respiration with perchlorate

Bacterial respiration with chlorate

Pollutant degradation in fungal bioreactors

H₂ in microbial electrolysis cells

Microbial fuel cells

Hydrogen generation via fermentation

Bacterial respiration with chlorate

Effect of fluid environment on mass transfer to bacteria

Particle transport in the subsurface

Using atomic force microscopy to understand bioadhesion

Dissertation: mass transfer to microbial aggregates and biofilms
Using atomic force microscopy to understand bioadhesion

Microbial fuel cells

H$_2$ in microbial electrolysis cells

Hydrogen generation via fermentation

Bacterial respiration with perchlorate
Getting Started…

• Why publish (besides the “publish or perish / tenure question?)
  – You didn’t do it unless you published it
  – People don’t believe it is good work unless it is (a) peer reviewed, and (b) in a good journal.

• Don’t waste your time on unimportant work-- Ask an important question!

• Pose a hypothesis

• Choose a journal (have a back up)
Plan the paper *before* the research

Sketch out a draft of the findings, in the form of a paper:

- Working title should make a statement (your hypothesis)
- “Introduction” should be 3 or 4 sentences - the problem, the existing conflict in the literature, and what you will do about it.
- Hand sketch 5 to 8 Figures that show what data you expect to collect, and how you expect it to look.
Title. States a hypothesis

What we think we know, and what the "controversy" is that motivated our research

Examples of figures that we expect to produce… and what they should show

- $O_3D + NR$ are separate enzymatic pathways in PKM
- $O_3R$ uses $O_3 + O_4 + NO_3^-$ (via radical e\textsuperscript{+} ) + "mimic" activity w/ NO$_3^-$
- Not all O$_3$- reducers = O$_4$- reducers.
- O$_4$, O$_3$, NO$_3$ can be simultaneously reduced in some cases.
- Some bacteria have NO$_3$ periplasm + membrane bound -- not sure if this could be other O$_4$- reach enzymes.

**Results**

1. **O$_3$- grown cells**
   - NO$_3$ used to small extent
   - $O_3$ to $O_4$ via $NO_3$ grown cells.
   - No O$_3$ or $O_4$ activity w/ NO$_3$ grown cells.
   - $NO_3$ acts as well, (No $O_4$ produced)

2. **NO$_3$ grown cells**
   - SDS Page
   - $O_2$ + $O_4$ + $NO_3$ + $O_3$ + $NO_3$ + $O_4 + NO_3$
   - No $O_3R$ or $O_4R$ bands

3. **O$_3R$ only**
   - $O_3R$ only
   - $NO_3$ only
   - All bands present w/ $O_4 + NO_3 + NO_3$
Example figure
Writing the paper

• Keep them simple
  – Intro: 3 paragraphs
  – Methods: short as possible, but can be reproduced
  – Results: *They tell a story.* Put your most important figures first. Limit figures to ≤9.
  – Discussion: Don’t speculate too much (and don’t combine with Results section)

• Work out a plan for first and last authors, and inclusion of co-authors

• Avoid reviews early in your career (they are not original research)

• Try to avoid publishing with your advisor once you are done with dissertation work.
Improving communication skills

• Form a seminar series
  – Student presentations of ~20 minutes in “conference style”
  – All presentations in English
  – Students in the audience are required to ask a few questions over the course of the semester
Improving communication skills

• Hold a weekly literature review class
  – Choose a new topic each semester (students should suggest these)
  – Professor chooses the first paper, and leads only the first discussion— and then attends but is as quiet as possible!
  – Students choose papers in following weeks
  – Focus your discussion on:
    • Identify the main hypothesis
    • Do the data support the statements?
    • Look at each figure and discuss what is says and if it is needed or helpful.
    • Are there errors in tables, figures, calculations?
  – Learn to be critical of what you read, and don’t assume it is correct because it is published!
Working with students—M.S.

• M.S. students are focused on finishing the day they arrive.

• Present each M.S. student with a “contract”: topic of research, one or two hypotheses and a list of what they should work on (but be flexible!). Don’t overwork them.

• Think in terms of three semesters:
  – Fall: Study literature, learn techniques
  – Spring/summer: Get most of data
  – Fall: Fill in data gaps; write thesis
  – [Students will usually miss fall graduation deadline and graduate in the spring semester]
Working with students-- Ph.D.

- Aim for a publication within the first two years.
- Guide the new Ph.D. student like an M.S. student for the first few semesters.
- Get them on a project from the start.
- Emphasize getting out of the department, and developing a specialty in another field (preferably science).
- Aim for a four-year (four paper) study program.
- Students from an M.S. in a foreign institution may take a little longer to graduate (to re-take courses in the US style).
- First two years, you help to guide them; last two years, they tell you what they are doing...
Advice on Publishing

• A publication can take a minimum of three years (start of research to publication)

• Don’t depend on your M.S. (or even Ph.D.) students to write papers (but encourage them to-- with first authorship)

• Have the “final figures” done before a student leaves (with data files in your hands or in the thesis appendix)
Teaching tips– Assistant Profs

• Try to teach the same courses the first few years.
• Avoid getting pulled into too many “guest lectures” in classes you are not directly assigned.
• Teach a graduate class directly in your research interests
• Don’t agree to teach a lab class without appropriate TA support
• Track and catalog exam questions and homework questions (students will keep copies of past exams)
• Enjoy yourself in the classroom– it is why we are here!
Conferences, Invited talks, panels

• Limit the number of conferences you attend (even if you can afford to go to more!)
• Each conference takes a month of your life for planning, catching up when you return.
• Accept invited talks to universities.
• Try to get on proposal review panels
Service

• Keep a modest to low profile
• Let senior faculty do the administrative work.
• Choose a few low-profile committees in your department after a few years.
• Try to chair a session at a conference
• Avoid chairing a department committee
• Get on at least one college or university committee before your tenure package is submitted to the university (year 5).
Questions?

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