PRINCIPAL INVESTIGATOR ADVISOR

The monthly update on management and funding for researchers in all fields

In This Issue

Your Name's Not on the Paper? Avoiding Disputes Over Authorship

You know that publication is the lifeblood of an academic career and that the names on the paper represent credibility (and thus opportunities) to continue that career. Failure to be listed when one deserves to be can threaten careers and trigger long-lasting disputes and ill will.

"Aside from copyright laws and federal definitions of research conduct as they pertain to plagiarism, nearly all aspects of authorship and publication are covered only by written guidelines and often unspoken custom," says **Dena Plemmons**, PhD, research ethics program director, University of California-San Diego. Plemmons spoke at a recent *Principal Investigator Association* audio conference.

How it's supposed to work

The standard guidelines come from the International Committee of Medical Journal Editors (ICMJE), says Plemmons. ICMJE offered a set

continued on page 2

Study Section Insider

Crafting an Approach Section That Enhances Overall Impact

by Christopher Francklyn, PhD

Among the five key judging criteria, reviewers tend to focus most of their attention on **Approach** — a measure of the strength of your overall strategy and methodology. That's because they can access logical and technical flaws in the approach more objectively than other sections (Significance, for example) where reviewer perceptions often come into play.

A good Approach starts with a strong hypothesis. How do you achieve that?

The first requirement, of course, is that it be testable. A useful hypothesis is also one that, if verified or falsified, will either drive out previous incorrect theories or open the way to new thinking about the problem.

A well-conceived hypothesis works in the PI's favor as a critical resource for the reviewers because it provides a framework against which the application's aims can be tested. Do the aims actually test the hypothesis? Can the aims provide a basis to refute the hypothesis if it is wrong?

Whether your hypothesis covers the entire proposal or you have a specific one for each aim is a question of personal style and of what best fits

continued on page 3

Authorship continued from p. 1

of guidelines in 1979 that have been accepted by many medical journals. IMCJE recommends the following criteria for authorship:

- Substantial contributions to conception and design, or acquisition of data, or analysis or interpretation of data
- Drafting the article or revising it critically for important intellectual content, and
- Final approval of the version to be published.

Key: All three of these criteria should be met. Individually, they are not sufficient. Neither is acquisition of funding or being general supervisor of a research group.

Why it gets murky

Here's the catch: Even though scientific-journal editors subscribe to these guidelines, many PIs have different ideas.

"Many scientists aren't aware of these guidelines, and many who are don't subscribe to them," says Plemmons.

Studies show that for 21 percent of basic science papers and for 30 percent of clinical studies, the above three criteria for authorship were not met, Plemmons says. "Co-authors may have had no involvement in the conception or design of a project, the design of the study, the analysis or interpretation of data, or the writing of the revisions."

Also, in a 1992 research study of 1,000 post-docs in the University of California system, about 50 percent of PIs wrongly believed that either their general supervision of the research lab or their obtaining funding (in the absence of any other contributions) was sufficient for co-authorship.

Further complicating matters: How should you define "substantial contribution?" Who defines it, and who meets the definition?

"In most authorship disputes, in my experience, all those involved thought they made substantial contributions," says Plemmons. "There is also disagreement about whether authorship should be remitted for individuals who contribute to all phases of the publication, or whether individuals who made more limited contributions deserve credit — in the form of authorship rather than another way of acknowledging contribution."

Real-life scenarios

Because authorship guidelines turn on interpretations of key phrases and standards not known or accepted by all PIs, preventing authorship disputes often becomes a managerial matter — specifically, managing authorship of papers to avoid surprises. Here are three recent, real-life, examples:

1. *"My name was on the first submission. Why didn't it get on the revision?"* An author discussed research with a student and had her draw two figures for a paper; that was the extent of her contributions. He wrote the paper, listed her as co-author and submitted the paper. It was rejected. He then extensively revised and re-submitted it to a different journal, this time without listing the student as co-author. The paper was accepted. It required

continued on page 3

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Authorship continued from p. 2

extensive phone calls between the institution and editor and several meetings to hammer out an agreement.

Note: Revisions after rejection may require extensive rethinking and even more time back in the lab. That could be an opportunity to increase the co-author's (i.e., the student in this case) role; however, if that's not possible or appropriate, you need to have a difficult conversation with the former co-author about what the guidelines are and why their contributions may no longer warrant inclusion.

Also: It is tempting to be generous with co-authorship, but, as this case shows, it can come back to haunt you. It's easier to say "No" upfront than to exclude someone later.

2. *"My co-PI promised a post-doc that if she did extra work acquiring data, she'd get an authorship listing. Then others who made similar contributions didn't get listed."* Two PIs didn't realize they had a potential dispute until it came time to list the co-authors. One had promised a post-doc co-authorship if she'd do some extra work on data acquisition. The co-PI said that data acquisition by itself fell short of the requirements for authorship. Now there was a conflict.

Note: Acquisition of data is an insufficient contribution according to ICMJE; however, some institutions and some PIs might have different guidelines. These need to be hammered out among PIs on a project ahead of time. Find another way to "motivate" post-docs, and make sure people are treated equitably.

3. *"I did most of the work on the first draft, then changed institutions."* At Temple University, a PI asked a research assistant and assistant professor of biochemistry and microbiology to write an NIH status update that would also serve as a summary manuscript suitable for publication. He wrote and submitted the status update and then left for another university. Later, a post-doc was asked to complete the article — and the departed professor assisted the post-doc in completing the project, only to discover his name was not listed among the authors.

Note: This led to an appeal to the university board, which unanimously agreed the departed professor should have received credit, but the PI refused to act on it. That led to a lawsuit in which the departed professor won the initial rounds — and the case will go to trial. (Cite: *Giordano v. Claudio, et al.*, No. 09-1456, E.D. Pa, 5/24/10).

What to do: Decide at project conception, not project completion, who the co-authors will be. A 1996 study at Florida State University showed that when this was done there were fewer co-authors per study, fewer "undeserved" authors and fewer authorship disputes.

You can add people later if the situation warrants, but only if you clearly decide the standards ahead of time, including why someone new deserves inclusion.

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Approach Section continued from p. 1

your science. But there should be a hypothesis — and it should not feel forced. Vague statements such as, "We hypothesize that tumor tissues and normal tissues from the same organ will have different patterns of gene expression" are virtually useless. Be more specific, perhaps saying, "We hypothesize that tumor tissue will display a gene expression profile showing elevated inflammatory responses."

Specific Aims at the core

While a strong hypothesis is a necessary first step, the real engine of your application is the three or four Specific Aims that make up the body of the research plan.

Why three or four aims and not one or two — or six of seven? There is no rule about how many aims a grant should have, but three to four is where the vast majority of NIH applications end up.

An application with only one or two aims leaves the reviewer with only one or two major experiments to weigh. Thus it's unlikely to have a broad enough scope to provide real impact on a field. With more than four aims, space limitations won't allow enough description to convince reviewers the aims are fully developed.

Three to four allow for enough experiments and description and are a better fit to the number of researchers the budget will support and the likely four-year project duration.

In crafting an effective and convincing Specific Aim, consider both the characteristics and construction of the aim itself and its relationship to the other aims. It is always a good idea to have each of the aims represent a somewhat independent project — not strictly dependent

continued on page 4

Approach Section continued from p. 3

on the success of the others. But if your aims are sequential, tell the reviewers what you intend to do if you get an unexpected result in the first one — i.e., why the whole project would not collapse. On the other hand, results in one aim might have a positive impact on the others. Thus, I like the concept of aims that are mutually reinforcing — e.g., "if Aim 1 has this expected result, it will enhance the quality of the findings in 2 and 3," etc.

In my own applications, I have settled on a somewhat standard format for each aim, consisting of separate sections for *Rationale, Experimental Approach, Outcomes and Alternatives.*

Rationale provides the strategic context: What are you trying to show, and why? This is also the place where you defend the specific approach to be used, consider alternatives and begin to describe the logic tree used to design the experiments.

In the *Experimental Approach* part of the aim, you must describe with great economy how the experiments will be performed. Try to build reviewer confidence that you can perform them. How?

Established PIs should highlight key papers in their bibliography that support their experience in the techniques proposed. New investigators either must show preliminary data demonstrating such familiarity or recruit collaborators whose expertise in the method is acknowledged widely.

A common flaw of inexperienced PIs is to omit the description of the *Outcomes and Alternatives.* An *Outcomes* section is necessary to describe the potential results of the experiments and the implications of different outcomes for the model(s) under consideration.

Experienced PIs often include an experimental flow chart that provides a glimpse into the broader strategic thinking guiding the project. Such flow charts can illustrate how the PI plans to prioritize between different approaches, which outcomes confirm the model and which undermine it, and what alternatives are available if an experiment fails.

A frequent complaint reviewers make regarding this section is, "Do they know what they will do with the data?" If reviewers are raising this questions, you haven't provided them with enough strategic context to appreciate where the aim is headed.

Importance of language, visuals

Reviewers can be reluctant to admit it, but a large factor that weighs on their enthusiasm is how your science is presented both in the language of your application and in its appearance.

Precise and clear writing is even more essential in the new shorter form application because reviewers will invariably be more enthusiastic about proposals that clearly explain the underlying science, logic and details of experiments. The harder you make the reviewer work, the more likely they are to be negatively disposed to your proposal and the more likely to invoke a "stock critique" out of frustration.

The visual counterpart to language is appearance and presentation. This includes fonts, spacing between paragraphs and the layout and look of the figures. All of these will either overtly or covertly influence reviewer interest and contribute to the final score. Where can you find guidance for this?

A wonderful resource for exploring different visual strategies for conveying complex scientific information is Edward Tufte's *The Visual Display of Quantitative Information.* In this and other works, Tufte methodically presents examples of a good and bad graphic design, particularly with regard to conveying scientific data in graphs and tables.

Approach score best predictor

NIH's Office of Extramural Research last year looked at the five reviewing criteria (Approach, Significance, Innovation, Investigator and Environment) and how well scores for each correlate statistically with one's overall impact score.

Based on this analysis, the score for Approach turned out to be the best predictor of the final impact score, with a correlation coefficient of 0.82.

The Approach section is also where many new PIs make one or more of the standard errors that are relatively easy to identify and describe.

Some bloggers have referred to these Approach flaws (with a fair degree of truth) as "stock critiques." They include: the applicant is "overly ambitious," one or more aims are "unfocused" or "underdeveloped," an aim is just a "fishing expedition" for a missing gene or interactions, there's too little description of results analysis, over-reliance on a preferred hypothesis, or an aim is just too "risky."

Many of these are enumerated in the NIAID (National Institute of Allergies and Infectious Diseases) "Grant Cycle" tutorial (http://funding.niaid.nih.gov/researchfunding/grant/cycle/pages/default.aspx).

Sometimes reviewers genuinely identify these flaws in a grant, but sometimes they invoke them as a cover

continued on page 5

Approach Section continued from p. 4

when they lack enthusiasm for a proposal and can't precisely articulate why. Anticipating these critiques during the writing of the proposal is one of the best defenses you have.

Knowing that the Approach score provides the strongest correlation to your overall impact score shows this section is where you should devote most of your grant preparation time.

Once your first draft is complete, always enlist at least one colleague far outside your field to read and critique it. If your colleague returns the draft brimming with excitement and anticipation, you are on the right track.

Dr. Francklyn is a veteran reviewer for NSF and NIH and served as an NIH study section chair. He is a professor at the University of Vermont, where his scientific expertise is in protein synthesis and RNA-protein interactions. He is also assistant editor of the Journal of Biological Chemistry. ■

Think Before You Sign or Say Yes On Behalf of Your Institution

Because PIs are open to so many opportunities to engage with outside entities, they must be careful never to sign or verbally consent to agreements on behalf of their institutions, experts say.

"If they do, it could create financial, compliance or reputational risks to their institution. Only those designated as 'authorized officials' have the legal authority to enter into agreements," explains **Linda DeLauri,** who led the Harvard Graduate Education Office of Sponsored Research for a decade and now advises universities and other nonprofits on sponsored research policy and practice.

Who are the authorized officials? At most institutions, they're a handful of senior research administration or procurement officers.

PIs who disregard this stricture not only can get into institutional hot water, but might end up spending a lot of time and energy working with administrators to untangle the agreement — either to rescind it or retroactively get an authorized version in place.

If you put your institution in that position, where it must force you to renege on promises you inadvertently made, your reputation suffers internally and externally, DeLauri warns.

To ensure this does not happen to you, she advises exercising caution with these four most common agreements:

1. Grants and contracts

Most PIs understand that funding proposals are submitted and grants accepted by their institutions on the PI's behalf, but still some sign grant agreements or contracts in error or in haste.

On occasion a sponsor letter may name the PI as the recipient, but that does not negate the fact that unless the award is a taxable — i.e., subject to personal income tax — fellowship directly to the PI, the institution is the official awardee.

If you inappropriately sign a grant document and return it to the sponsor, it will delay institutional acceptance of the award, slow account set-up and prevent you from having timely access to grant funds, which in turn delays hiring research staff and so on, says DeLauri.

The worst-case scenario is signing an agreement with a sponsor that not only conflicts with institutional policies but restricts your right to control your own work. This forces the authorized official to reopen and renegotiate terms you accepted.

What should you do instead of signing? Whenever you receive an agreement, read it; mark it up with questions, changes or concerns; and share it with the appropriate person who is authorized to negotiate grants and contracts on behalf of your institution.

2. Procurement agreements

All PIs should exercise caution before entering into procurement agreements with vendors for services likely to be used by other PIs throughout the institution, such as data coding or analysis, laboratory blood analysis, safety or equipment training or software licenses.

A PI may think he/she is negotiating rates, terms or limitations that match his project budget and needs, only to discover the terms bind the entire institution, DeLauri says. Other PIs are now locked into terms that don't meet their needs or funding levels.

continued on page 6

Think Before You Sign continued from p. 5

Institutional agreements take into account the perspectives and finances of the entire community that may be served by a particular vendor. Never sign a vendor agreement without reading it and fully understanding the commitment it represents.

As with grant and contract agreements, review and share it with the office authorized to negotiate procurement agreements on behalf of the institution.

3. Sponsorship agreements

Whether it's a visiting scholar, a foreign national post-doc or a high school intern, PIs should consult their local administrator before offering any form of institutional sponsorship to individuals.

Perhaps lured by the promise of free labor, PIs might overlook risks associated with agreements to sponsor outside individuals, DeLauri says. Agreeing to seemingly innocuous requests may result in unanticipated costs or conflict with institutional policy.

Example: PIs should never agree to provide office or lab space, academic appointments/titles or services. Instead, ask an academic or research administrator whether sponsorship is possible and what must be done in advance to ensure the relationship is appropriate and mandatory safeguards are in place.

Another example: A student intern may need parental permission, safety training or have to provide evidence of health insurance. A visiting scholar is likely to require an office, computer and phone — scarce resources at many institutions — and may, in conflict with your institution's PI policies, plan to seek funds under your institution's aegis.

4. Fiscal agent agreements

"If you are approached by unaffiliated individuals hoping to run money through the university or a former student who needs a fiscal agent for his nonprofit start-up, do not hesitate to say No; your administration will thank you," DeLauri says.

Fiscal agents agree to accept and manage funds on behalf of external entities, usually when the external party is not eligible (i.e., not a 501c3 nonprofit) or lacks necessary accounting systems.

An institution acting as a fiscal agent is 100 percent responsible for the proper use and accounting of the funds. Many institutions have policies governing fiscal agent agreements and allow them only under limited circumstances, such as collaborative projects that involve multiple partners and multiple funds, or grant agreements that position the institution as an "intermediary" organization charged with developing and administering regranting programs on behalf of the funder. ■

Dual-Career Scientist Couples: Negotiating a Good Package Deal

If you and your spouse are both high-achieving PIs, at some point in your careers another institution may recruit you for a coveted teaching and research position.

Should that occur, your partner or spouse likely will need employment, too — probably in the same academic milieu as you. If so, don't hesitate to incorporate his or her professional needs into your contract negotiations.

Requesting such assistance as part of your compensation package is perfectly fine. Most PIs being recruited do.

Just don't ask for more than your stature merits — and be sure your requests are reasonable.

"Seriousness should be evident before the first interview ends," says **Danny R. Welch,** PhD, a professor and director of the Howard Hughes Med-to-Grad Graduate Program and the Cancer Biology Graduate Program at the University of Alabama at Birmingham. "Simply asking for information and introductions or referrals (for the spouse) indicates seriousness."

Eric R. Bittner, the John and Rebecca Moores Professor of Chemical Physics at the University of Houston, has seen spousal support negotiations from both sides. He and his wife were jointly "on the market" about 15 years ago, and now he heads a department. He offers these tips for setting up a win-win negotiation situation:

- **Know your place in the PI food chain.** "A candidate for assistant professor would have little leverage to demand we find employment for the spouse," he points out. "However, we do try to make suitable connections for the spouse. A more senior hire has more leverage because clearly we would not be able to recruit the star without the other — who may also be great, but not the star." He adds: "I think it's a reasonable demand that the university help secure a job for the spouse, especially if that spouse has a productive career and is of suitable caliber and stature for the given institution."

continued on page 7

Dual-Career Couples continued from p. 6

- **Know who has the upper hand.** "Negotiations are like dating," Bittner says. "But in the end, the university always has the upper hand because it can rescind the offer at any time."
- **Remember one of the basics of contract negotiation:** "Always get things in writing," Bittner advises.
- **Be sensible about perks.** While a car for your spouse in lieu of a job offer may seem to ooze "superstar PI perk," it's a definite "No" to recruiters like Bittner because of all the ownership issues — especially if you're looking at a state school. Stick with trying for a reasonable job for the spouse, even if it's not the perfect fit for him or her; once inside the institution, it will be easier to maneuver into a better position.

David Hodgson is professor and head of the department of Large Animal Clinical Sciences at Virginia Polytechnic Institute and State University. His wife Jennifer also is a professor there, as well as associate dean for professional programs. After almost 30 years as a dual-career couple, they offer their own tips for making contract negotiations work for you, your partner or spouse and the university that's trying to hire you:

- **Be flexible.** When he was recruited for his position, she accepted a position as instructor. That might not have been her ideal, but it soon led to the career progression that ended up at the position she now holds.
- **Aim high.** Target larger institutions that would likely have more career options for your spouse.
- **Play to your strengths.** Don't hesitate to point out the gender diversity a husband-and-wife hire would bring. Most institutions recognize the value of that.
- **Don't be coy.** Be upfront about it if you are unwilling to consider anything other than a package deal.
- **Do your homework.** Research and visit the institution — and try to talk to some of its PIs — to get an understanding of exactly what the institution needs in your department and what each spouse could contribute. ■

Conflict Management That Brings Positive Change to Lab Environment

If everyone's quietly doing their job in your laboratory and there are no apparent conflicts, everything's fine. Right?

Not necessarily, says **Howard Gadlin,** PhD, ombudsman and director of the NIH Center for Cooperative Resolution and author on conflict management.

"Many approaches treat conflict as a bad thing — something that should be minimized or avoided as much as possible," Gadlin told a recent *Principal Investigators Association* webinar audience. But conflict has some upsides as well, he says. These include:

- **The airing of problems.** If everything in the lab seems to be going along swimmingly, that may actually be the case. But it could also mean that no one is talking about the problems. There may be serious problems no one wants to discuss.
- **Expressing dissent.** You know that the party line can be wrong, and you want free-thinking, creative individuals on your staff. Dissent has an important role: It forces people to analyze their positions in front of others and vice-versa. The result of dissent (not insubordination) can result in better and stronger ideas.
- **The surfacing of discontent.** This is a little different from airing problems in that discontent might be something deeply personal. Someone may not be happy in their current role even though there's no real problem with the lab management. Better it surfaces than lies buried and festers.
- **Stimulating change.** This is the greatest benefit to conflict. Resolving conflict can result in more trust between PIs and their staffs, demonstrating to all that problems are addressed and dealt with.

"Think about conflict as something to be appreciated, something inevitable, something that's a natural outgrowth of people working and living together," says Gadlin. "And that it's important to figure ways to understand conflict, to appreciate it and, in some cases, to use it for our purposes."

What you can do

Gadlin recommends the following five steps in managing laboratory conflict and using it to create positive change:

1. Differentiate between hostility and disagreement. Hostility is unproductive, often value-driven and is personal: People become far too emotionally invested in an idea or methodologies. But professional disagreement is necessary.

continued on page 8

Conflict Management continued from p. 7

"Science depends on disagreement," says Gadlin. "Disagreement is conflict about intellectual and scientific ideas."

2. Be alert to signs that a conflict has become personal. Avoiding personal conflict is an ideal. As Gadlin says, it's naïve to think all personal conflict can be avoided. But you can identify when someone moved beyond disagreement:

- When the substance of the discussion moves from an attack on ideas to an attack on the person.
- When you see defensiveness rather than curiosity. "One of the signs that allows me to assess whether a conflict has become personal is whether the parties maintain a curiosity toward one another," says Gadlin.

3. Take a stance of curiosity toward any kind of conflict you find, says Gadlin. Ask questions to find out why someone is agitated or concerned, whether it's personal or ideas-based disagreement.

"When you demonstrate toward the other person's argument, you open up the possibility of creating better understanding," he says. "When you move away from that, you limit the possibility of better understanding."

Goal: Get to the point where the disagreeing parties can move collaboratively toward making a decision. To do that, you have to identify the underlying assumptions.

4. Know your own and others' style of handling conflict. This will help you understand how to proceed. Styles include:

- **Competitors.** You win, they lose. *Example:* You get the laboratory space you want, and the other person doesn't. If it's about winning, call attention to it. Most people want to be seen as collegial, and making someone else lose, while occasionally necessary, makes people feel selfish and unconcerned for others.
- **Spiters.** Both sides lose. *Example:* The conflict degenerates to the point no one can use the laboratory space without being hassled or interrupted, and that takes away from research time. Both sides are hurt. Bring them together and talk it out.
- **Accommodators:** These are people who naturally give self away to avoid conflict. You agree to lose, they win, and the conflict goes away. Bring the parties together and reason it out. *Example:* Someone agrees to give up and let the other person have the space even though they may have a

continued on page 9

Conflict Management continued from p. 8

greater need for it and it may hurt their career. This is the flip side of competitors.

- **Collaborators:** This is the clichéd, but true, win-win. You identify the results you are looking for and see if there is a way for both sides to get the results they want. *Example:* You work out a schedule for sharing the lab in a way that is adequate to both parties' needs while more space is obtained.

5. Think about how to get the win-win while avoiding bad compromises.

In all this, there is a problem called compromise. It falls into all these categories — compromises can cause both sides to lose, one to win and one to lose, or both sides to win. For example, say you agree to share the lab half the time every day. That could just slow down both your work and even threaten your funding.

However, say you work out a schedule based on a sliding scale, with lots of communication, where both teams are in the lab at the same time but use equipment more intensively when they need it, offering it to others during their less time-intensive periods. Individual conflicts are worked out on a case-by-case. Perhaps in extreme cases where both sides need the equipment at the same time the teams can plan for this and share the costs of renting out extra lab space.

Remember: People usually are united in the questions but divided by the answers. The first step is to agree on the question, and then see if there is a way to get the results they want. Usually, this means discussing the means to get there and uncovering any underlying assumptions.

For example, say that in the course of the discussion about sharing equipment you realize that the other PI's team has time requirements that don't quite add up to your experience. You probe further and learn that the other team has two new members who aren't as experienced on the equipment yet. Perhaps a win-win is to find ways for those newbies to get up to speed more quickly. Enhanced training and practice during low-use hours, even offering some of your experienced staff to help, may generate a win-win scenario.

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Has Lab Become Dysfunctional? Some Common Causes, Solutions

How can you prevent or correct dysfunction and consistently run a productive lab with a happy staff?

Dr. Bruce J. Mayer, associate professor of genetics/developmental biology at the University of Connecticut Health Center at Farmington, finds that his "hands-off" management style has worked at his lab for the past 10 years. He typically has six to 10 staff members — post-docs, graduate students and technicians.

He once faced a potentially serious situation when a graduate student began disrupting the lab environment with bizarre behavior. Mayer intervened, working with institutional sources; the student got psychological help and eventually left. Mayer said he didn't pay enough attention to warning signs during the hiring process. The individual had behaved badly at previous labs.

Mayer relies on an open-door policy and weekly staff meetings to support his management style; he encourages all to speak up at the meetings and trusts his staff to be self-motivated in handling their assignments.

Dr. Steve Koch, assistant professor of biophysics at the University of New Mexico, says he values the management principles he learned in a class on entrepreneurship he took while earning his PhD at Cornell University.

At the Koch Lab, he manages five graduate students and one undergraduate. He trusts his students to run the lab because they are good at it.

When he hires people, he tries to identify their specific talents and make lab assignments that match those talents, which typically results in a productive, content staff. He asks: "What's the most fun thing you do in the lab? What do you hate doing?"

Example: An undergraduate highly proficient with computer software will be happier and more productive recording and managing data on electronic spreadsheets instead of making written lab notebook entries. That task can be assigned to a staffer who takes pride in maintaining notebooks and who can't stand to work with Excel.

Koch learned the managerial technique of recognizing and respecting individual talent from one of his mentors, **Dr. Francis Collins,** who ran the human genetics lab at the University of Michigan at Ann Arbor. That's where Koch earned his undergraduate degree. (Dr. Collins later led the Human Genome Project and is now director of the National Institutes of Health.)

"I was just an undergraduate washing dishes in the lab, and he invited me to lab meetings," Koch said. "He

continued on page 10

Lab Dysfunction continued from p. 9

did it to show me respect," so Koch tries to emulate showing that kind of respect to all his staff members.

Here is a compilation of recommendations from Koch, Mayer and **Dr. Kathy Barker** of Seattle, a former PI and author of *At the Helm: Leading Your Laboratory*:

1. Pay attention and intervene early when you notice a potential problem. Warning signs vary but often include chronic lateness, slovenly appearance, radical outbursts or silence. These can be signals of at-home issues, substance abuse or conflict with colleagues.

Have a private talk with such individuals to see what's behind the behavior. Give them a set time to improve on minor infractions, but let them know that disruptive behavior will not be tolerated. If two employees are in conflict, bring them together and hear both sides in an attempt to instill understanding and resolution. Many disagreements are over petty issues, such as length of lunch breaks, and can be resolved with uniform policies.

2. Issue firm reminders. If data recording, lab notebooks and lab organization are getting sloppy due to laziness, remind each staff member of his or her duties to keep the lab safe, clean and ordered for peak performance. Put those who ignore such reminders on notice.

For serious infractions, such as data mismanagement, personally review the data, determine the cause (sloppiness, actual fraud) and take appropriate actions. Sloppiness can be corrected with verbal and/or written warnings and continual close monitoring until a problem is resolved. Fraud is typically an offense triggering dismissal and will involve the Human Resources department.

3. Examine yourself. Could you be contributing to low morale by intimidating your staff? You might be if any of the following are true: You rely mostly on one or two people, creating a perception of favoritism; people don't readily comment in your meetings; others give in too quickly to your opinion; staffers don't seem confident, as though waiting for their ideas to be rejected; or few people come to you with questions or concerns. If these problems are in evidence, turn them around by spreading around important tasks, inviting and accepting opinions, and encouraging staffers to speak up; thank them for doing so.

4. Explain your management style. If yours is the "hands-off" style, let staffers know they are trusted to complete work without your constant supervision. You may need to adjust your style at times; some thrive on micromanagement, but that will become apparent if they consistently ask for help or instructions.

5. Have regular weekly lab meetings. Encourage everyone to speak by asking them questions, or handing out agendas where everyone has a topic on which to comment.

6. Distribute written policies on working hours, vacations, lab notebooks and other organizational matters to ensure fairness. For example, lifestyle conflicts over work schedules between parents and non-parents, a common occurrence, can be prevented or resolved with clear policies.

7. Communicate expectations. Unspoken expectations "are the biggest reason for conflict," Barker says. Tell staffers at the time of hire what's required, and give gentle reminders when necessary.

8. Celebrate victories with praise or get-togethers — perhaps special restaurant lunches, occasional after-hours drinks or a small party in the lab with cake or pizza. "Social interaction reminds staff members that you care and that they like each other," Barker says.

9. Periodic staff evaluations provide you with a documented performance record and keep staff members accountable.

10. Terminate when necessary. If any problem becomes chronic, you may have to fire a staff member (working through the HR department). "If you are thinking of firing, this is where periodic evaluations are useful because you have documentation," Barker says. ■

Keeping a Good Lab Notebook — a Safeguard for Inventions

Under U. S. law a patent is granted to the first person to *conceive the idea* for the invention — not the first to apply for the patent. So your well-maintained laboratory notebook is critical evidence of the date an idea was conceived.

Another important factor for establishing an inventor's *priority*, or right regarding an invention, is determining when the invention is "reduced to practice" — i.e., when the invention does what it's supposed to do.

If you take careful notes, your laboratory notebook can help establish both the date of conception and the date that the invention is reduced to practice.

There are a few legal rules that apply to the admissibility of evidence that can be used to establish priority. For one thing, an inventor's oral testimony must be corroborated by physical evidence — such as the lab notebook — that has been witnessed by someone other than

continued on page 11

Lab Notebook continued from p. 10

a co-inventor or by another person who is not a co-inventor. This is vital to establishing an inventor's claim to priority.

However, physical evidence (such as data or auto-radiographs in a laboratory notebook) that has been witnessed by someone else doesn't need to be corroborated.

Electronic notebooks with data-management systems are also widely used. But because they're not always acceptable in legal proceedings as substitutes for original, permanently-bound, handwritten records (especially when you're asked to prove the dates of inventions in patent cases), you must still keep a hard copy of all data, according to **J. Peter Fasse and Ingrid A. Beattie,** intellectual property attorneys, Fish & Richardson P.C.

Additionally, your goal in keeping your notebook is to ensure that someone who didn't work with you could use it successfully to prepare a report, publication, or patent application based on your work without any other input from you. In industry, your notebook often is issued to you by your employer but still belongs to the company, so it's critical that it adhere to professional standards.

While you may know generally how to keep a lab notebook, here are some tips — and reminders — to make sure yours always meets high standards in case it's needed to resolve a patent question or any other unforeseen issue:

- Use a permanently bound, hardcover book with pre-printed page numbers. If your lab notebook does not have page numbers, you should number the front and back of every page at the top outer corner in permanent ink. This indicates that you've entered information in chronological order and that you haven't added or deleted any pages.
- Clearly record your name and the starting date of the entries on the inside or the outside of the front cover.
- Use the first three pages for a table of contents. As you add new projects, include them in the table of contents.
- Start every new project on a new right-hand page. Then title the page and list the names of those working with you.
- Date every page in the same place — e.g., top center, top right corner, bottom right corner, etc.
- Never remove a page from the notebook.
- Tell the story of your project clearly in a narrative style. Describe the objective of the project, your theory for the outcome or outcomes, your methods, materials, and equipment as well as the reason for each set of measurements or calculations. As your project progresses, include any ideas, conclusions and information about the other equipment and procedures you use and your additional observations. For example, you could document a problem with a particular piece of test equipment.
- Enter all your observations and data on the right-hand pages.
- Cite the sources of any information you use from a data sheet, textbook, etc.
- Record your observations and the formulas you use for calculations as you work, even if you do the actual calculations with a spreadsheet.
- Record all the information in permanent ink and keep all your entries as part of the record.
- Don't mark over or white out any entry. Instead use a single line (in ink) to cross out any mistakes so that they can still be read. If you make any changes, date them and put your initials next to the date. You can re-enter tables or figures any time you want to better organize your work. But to avoid confusion, be sure to put a line through a table or figure you intend to re-do, initial and date the change, then write down the page where you've put the data you've reorganized.
- Leave several blank pages at the end of each experiment for further analysis and conclusions. If you don't use all the pages, you can draw lines through them from corner to corner and initial them.
- Clearly identify the original experimental data. If you can, use tables to make the records easier to understand. Record the units of your measured quantities, not just the values. If you record the data readings electronically, print out a copy and attach it to your notebook. (Tape or glue the entire length of each edge to the page.)
- Include all calculations, figures, and sketches on the left-hand pages. Be sure to clearly identify the steps in a calculation and the units of all the quantities you use.
- When you finish a project, summarize your results. Summaries help you keep continuity by indicating where you left off your work and your plans for continuing the project. You don't have to draw conclusions, you can just indicate the data or observations you've collected, any samples you've saved including how and where you've saved them and any other relevant information that sums up the study.
- If your work leads to an idea that you want to patent, summarize the concept clearly in a separate entry. Then have your corroborator sign and date the entry. In addition, ask a third person who is able to understand your idea — but not an inventor — to sign and date this entry.

continued on page 12

Lab Notebook continued from p. 11

Here are some other tips and reminders from Fassea and Beattie on optimal ways of keeping an electronic notebook that's useful when proof is needed:

- Retain electronic back-up copies and keep them in a place free from magnetic fields or other corruptive conditions.
- Print out a hard copy of the computer-generated data and label, sign (have someone witness it) and date it. Then permanently attach the hard copy to your handwritten notebook.
- Reference all electronic data in the handwritten notebook.
- Store the hard and soft copies with a record custodian who can vouch for their integrity.
- Regularly validate your computer systems for reliability, accuracy and consistent performance.
- Use virus-protection software.
- Don't allow electronic records to be modified. Use hardware and/or software that will prevent editing.
- Don't allow unauthorized computer access. Use key and screen locks and removable storage devices that you can be lock away when you're not using them.
- Use electronic/digital signature or encryption hardware and/or software.
- Change individual user codes and passwords frequently and delete user codes when people leave. ■

Send in the form below to keep your issues coming each month!

Coming In Future Issues

- How Early Investigators Can Support Their Position as Lead PI
- Weighing the Severity of Workplace Threats
- Striking a Good Balance Between Teaching and Research
- Protect Yourself Against Unfounded Complaints
- How to Become a Better Communicator
- Using Your Sabbatical Wisely