

Becoming a Principal Investigator: Designing and Navigating Your Academic Adventure

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Starting your own academic lab is a wonderful opportunity to impact science through research and trainee mentoring. In this article, we share some thoughts and resources for this undertaking in the hope that they may enhance the experience of others.

Introduction

The job of the principal investigator (PI) is one of possibility, joy, creativity, and opportunity. It is one of the few paid gigs that allows nearly limitless and self-directed variations on what success looks like and how it is achieved. At its best, it also allows individuals to freely pursue their ideas bounded only by their interest and ability. Yet, when we step into the role of a PI, we are no longer a team of one. Instead, our success is now dependent on our ability to form, lead, inspire, and manage a group of trainees. Because most of our own training to this point has focused on research, we can often find ourselves without the necessary leadership skills to navigate this process. In the past few years, both of us have started our own labs at quite different institutions. Our scientific paths have been unique, our personalities are different, and our research is distinct, and yet, we found ourselves facing the same challenging conundrums with a joint sense of gratitude for the opportunity and anxiety about getting it right. To help us navigate this process, we have relied on extensive discussions with seasoned PIs, other new PIs, mentors, leadership trainers, and HR experts. In this article, we provide perspectives from the trenches on what we have learned, including: (1) building an intentional culture; (2) strategic planning; (3) effective recruitment; and (4) growing skills for success. While every individual and situation is unique, we hope these real-time perspectives inform future and new PIs in designing and navigating their own academic adventures.

Defining Your Lab: Intentional Values and Culture

Culture is the compilation of beliefs and behaviors that govern how a group of people interact and make decisions. Every organization has its own unique culture, and labs are no exception. If left to its own devices, the values and culture of a new group will arise organically, deriving from the people within it and the institutional environment. Once a culture has become established, it is often difficult to change as it can be passed from one generation of lab members to the next. If you are lucky, the organic values and culture that grow may match what you desire. Yet, this is often not the case. Indeed, many of us may have experienced challenging or even debilitating lab cultures in our own training. Fortunately, as the head of the lab you can directly shape the culture that your lab adopts.

Start by defining what values are important to you. Do you most highly value hard work, creativity, collaboration, diversity, or collegiality? Consider choosing three words that communicate your core values as a person and a scientist. Next, clearly define what these values mean in a sentence or two. Writing these values down will make it easier to communicate them to your group and to reinforce them. Try to bring these values to life in your lab meetings, one-on-one meetings, collaborations, and your own behavior. And once you have defined your cultural values, you can help enable group members to exhibit them such that the decisions and behavior of the group begin to be derived from these values. You can also begin to recruit people to your lab who exhibit

these traits. We have found that setting an intentional culture increases productivity, streamlines decision-making, enables better hiring decisions, and strengthens the scientific training environment and group cohesion. It also makes for a stellar and inspiring work environment for you and for your lab.

Strategic Planning: Enhancing Science and Productivity

Just like any small business, an academic lab can increase its impact, productivity, and thus fundability by developing and executing a strategic plan. This plan can be composed for different timescales, but a useful starting place can be a two-tiered approach composed of short-term (3 to 6 months) and long-term (1 to 3 years) goals. This plan acts as a map that defines for yourself and for your group where you are headed and how you will get there. There are many ways to structure strategic plans, but we suggest that they should contain at least four components: (1) the scientific mission statement of the lab; (2) what is most important right now; (3) how the short-term goals will be achieved; and (4) the longer-term vision or plans for scientific growth. Let's tackle each of these areas in turn.

The *mission statement* of the lab should be broad and impactful. Apple provides us with a good example. Their original mission statement was not to make computers. Rather it was, "to make a contribution to the world by making tools for the mind that advance humankind." Thus, though their products would change over time, their mission would be consistent. By analogy, the mission of



your group should be meaningful and stand the test of time as the science evolves.

Next, decide *what is most important right now* (3 to 6 months) and make a list. Is it purchasing all the major equipment for your new lab? Getting an R01 funded? Hiring two new people? Submitting three papers that are near completion? Define your priorities and set a realistic timeline.

Third, write down *how you will achieve these goals*. For example, will you leverage the whole group to push papers to completion? Or will you take the full day on Tuesdays and Thursdays to write that grant? Think about what resources, people, time, and organization structures will help get you where you want to go.

Fourth, write down the *longer-term goals of your group*. Where do you want to be in 2 years? What publications/grants/technology/employees would you like to have and what might you need to do now to help make this possible?

Now that you have a strategic plan, it's time to implement it. Call a special meeting with your group and communicate your ideas and the reasoning behind your plan. Talk about what each lab member can do to make that plan a reality, and build in milestones to help hold yourself and your lab accountable. This can also be an excellent springboard toward helping trainees complete their individual development plans so that individual and group goals are aligned. You can take this process a step further by detailing a project management plan for each project or paper and structuring each goal. There are many software packages that aid in this process, including OmniPlan, Trello, and many others. In addition, Slack can be a good way for the lab to sync its discussion and for subgroups working on a given project to communicate.

Finally, consider the strategic plan as a living document that should be evaluated and updated annually. In these evaluations ask whether the lab achieved its goals for the year. Celebrate successes and identify bottlenecks or impediments that may have caused shortfalls. We find that annual lab retreats or "state of the lab" meetings are a good time to evaluate progress, update plans for the future, and build group cohesion around these goals.

Effective Recruitment

Staffing a lab is one of the most important of all new PI tasks, and it's also one of the most challenging. Since the people in the lab are the ones who primarily do the bench work, identifying and recruiting the right people are essential for a successful laboratory. However, accomplishing these tasks can be challenging even for seasoned group leaders. Below, we provide some perspectives for identifying, recruiting, and retaining good people as a new group leader.

Finding Candidates

As new PIs, we are often relatively unknown. This means we need to go the extra mile to put ourselves out into the community so that we can recruit people into our labs. What can this extra mile look like? There are many options, but we have used the following strategies effectively. First, give local talks. It can be challenging to attract good candidates nationally at the beginning so often some of the best talent can be found close to home. These need not only be data talks. Several of our hires have approached us after we've given non-data talks on topics such as the academic job market. These types of interactions can point out the unique training environment that you offer and showcase your mentorship abilities. Second, go out of your way to interact with students. While postdoctoral fellows may want to go to well-established laboratories with track records of success, many students actively seek out new PIs with smaller labs who may have more time for one-on-one mentorship. Effective strategies for interacting with students can include teaching, serving on graduate student program committees, participating in recruitment events, going to social events and talks, or simply saying hello to new students in the hallway. In addition, get to know students at local and national meetings who could become future postdocs. Once you are fortunate enough to attract trainees to your lab, treat them well and foster their professional growth. Students and postdocs talk to each other, and one of the best recruitment strategies is being a good mentor who has a real interest in trainee success. Third, leverage your network. When recruiting, email your colleagues and friends, advertise at local universities and attend their job fairs, post on

Twitter and LinkedIn, visit student posters at conferences and let them know about your group, ask your lab to be on the lookout, and get the word out about your position. Our experience has been that great hires can come from any of these approaches, and casting as wide a net as possible increases your chances of finding desirable candidates.

Evaluating Candidates

Once you have identified candidates interested in your lab, the next challenge is determining what a "good" candidate looks like for your position. It helps to have a precise idea of what you are looking for and how you will evaluate a candidate for these features. Stick to your guns. Everyone is motivated to get people into their lab when starting out, but making bad personnel decisions at the beginning can have serious consequences. Be patient. In making hiring decisions think about what is most important for your science, your strategic plan, and your lab culture. This greatly simplifies the selection process and makes designing an appropriate interview easier. Are you looking for a specific skill set and will hire only in that space? Will you take all comers as long as they are trainable? If so, how will you determine who might be trainable? How will you assess the skills of these candidates when you interview them? And finally (and perhaps most importantly), how will you assess if they are also a good cultural fit for your group? Speaking directly with references regarding these issues can provide crucial insight.

In addition, you may find that your hiring plan needs to be flexible. When we started our groups, we had master plans that included recruiting certain skills to the lab in a certain order. Within 6 months, we had to throw those plans out the window. These unicorn candidates did not exist; at least, not in our applicant pools. Instead, we redesigned the lab around the skill sets of the people whom we were fortunate enough to attract. This requires flexible thinking and planful management but has the advantage of optimizing for trainability, passion, commitment, and cultural fit. In this latter approach, then, it becomes vital to know what personal and culture features you are looking for and develop ways to assess them. Among other features, we

look for and attempt to evaluate a candidate's drive, resiliency, and humility. One approach is to combine an in-person skills assessment during an interview together with questions designed to understand why the person is engaged in science. This can take several forms. For example, if your work involves molecular biology and tissue handling, you could combine a written assessment of basic solution preparation and cloning principles together with mock tissue preps. This could be followed by questions designed to learn about a candidate's personality and approach. The questions and assessment should vary depending on the position you are hiring for, but intentionally interviewing for scientific qualities as well as for the personal traits that will bring out the best in you and the lab will help increase the chance of a successful hire.

Getting Good Candidates to Say Yes

Your next job is to get your best candidate to agree to join your young, but promising, lab. This can be a challenge because new PIs are competing for good talent with industry, established faculty, and a myriad of other career trajectories. Thus, you need to develop an effective closing strategy. The first piece of this puzzle is articulating what advantages your group offers. New PIs have several things working in their favor that they can offer: enthusiasm, flexibility, time, attention, and usually lots of good scientific ideas. The challenge is knowing how to effectively communicate this to incoming candidates. We have found it effective to follow up an interview with a phone call or email in which you clearly lay out all the advantages your group has to offer. Here is where your work on intentional culture comes into play. You can communicate your training culture to potential recruits so that they know they are signing on to an environment that is aware of and values them. You can also communicate how these values shape your mentoring style, science, and expectations of lab members. Finally, you can use this conversation as a platform to learn more about what the interviewee is looking for in an employer so you can make sure these needs align with your goals and approach. Achieving clarity about what you and your group offer and communicating your approach to mentoring will help candidates know

they will have a firm foundation for the future.

Foster Inclusion and Diversity

Science may be a calling, but for many the sound of this call can be distorted by elitism, unconscious bias, or simply a stringent "survival of the fittest" culture that can naturally advantage trainees with particular pedigrees or experiences. As lab heads, we have the power to change this. In fact, we believe that it is our responsibility to do so intentionally and actively. To address this, we have to become aware of the problem, not shy away from discussion, ask and listen, be open to new ideas, admit when we are wrong, and be willing to change. We also need to closely examine our own systems of evaluation in hiring and recruitment to determine if they are biased to exclude or devalue particular groups, identities, races, cultures, or genders. The traditional "meritocracy" at play in many hiring decisions can itself present problems. As so beautifully stated by Kenneth Gibbs in a recent article, "... 'scientific talent' is not innate. It is cultivated through many hours of training and effort. Moreover, teams, not individuals, conduct most scientific research. ... When we consider scientific research as group problem-solving, instead of the unveiling of individual brilliance, *diversity becomes key to excellence*" (Gibbs, 2014). Diversity and inclusion lead to better and more productive science by increasing the spectrum of ideas, perspectives, and approaches in our work and our solutions.

Employee Transitions

While all of us hope and expect that all of our hires will be successful, sometimes this is not the case. An employee that is underperforming or exhibiting behaviors that are unacceptable can rapidly become detrimental to the group environment. Further, if not dealt with this can result in "sanctioned incompetence": the appearance of multiple standards for performance among employees that can compromise motivation and productivity overall. First, be proactive in evaluating your employees and providing feedback, both positive and negative. If problems arise, say something—the sooner the better. Importantly, have these conversations in private and with compassion, but don't wait for days or weeks to correct a

behavior. Second, document your conversations and communications. Be clear about what needs to change and when and how this change will be evaluated. Finally, become familiar with documentation requirements, and if needed, offboarding rules and regulations at your institution. While employee transitions are never easy, being prepared helps smooth the process for all parties. In addition, an outcome that better matches the employee with a more appropriate job or employer will result in an improved future for the lab and the individual.

Growing Success

As a new PI, it is often easy to feel somewhat powerless or overwhelmed in the face of the need to master a host of management and leadership skill sets we may lack. While we certainly learn from our mistakes (and we will make them), these errors can be costly to our productivity, lab environment, budget, and personal sense of well-being. Fortunately, there are ways to minimize the number of mistakes we will make by identifying our strengths and weaknesses as PIs. We can then put into place a plan to improve those areas in which we are weaker. We discuss some approaches to achieve this below.

Identify Your Strengths and Improve Your Weaknesses

Each of us excels in certain areas and struggles in others. The good news is that we don't have to be good at everything to succeed. In addition, the skills of leadership, management, politics, networking—all of the things we discuss in this article—can be learned. The first step is to perform an honest self-evaluation of your own PI skills and deficiencies. The next step is to apply the principles of science to becoming a more skilled PI. If there were a new protocol you needed to learn, you would first identify someone who was an expert in that approach. You would then ask them to collaborate so you could learn the approach, watch them, practice, and then try it yourself repeatedly until you had mastered it. Leadership skills are no different. For areas where you'd like to improve, look around for faculty who are knocking this area out of the park. Get to know them. Don't be afraid to use the words, "Will you be my mentor?" For example, we each have different

faculty we seek out for different sets of conundrums: the grant-writing gurus, the trainee whisperers, those who navigate sticky political situations with ease, etc. It also can be incredibly useful to have a set of peers at a similar career stage with whom you can bounce ideas off of. Local or virtual peer mentoring groups such as New PI Slack and Future PI Slack can provide such communities. Having someone to talk to when your grants or papers get rejected, or when you've had a difficult interaction, can make you feel less alone and can help you navigate these situations. Ask for what you need and seek help early and often. This allows mistakes to be less frequent and less costly. We also need to strive to admit when we've made mistakes and apologize—not only to colleagues, but also to our trainees. Being honest about where we are at in our learning trajectory can help everyone approach the young lab environment and the new PI with a sense of understanding and helpfulness.

Build Your Network with Intention

Now that you've identified mentors who can help you grow and develop PI skills, it is time to expand this network to help support your personal and professional growth. These individuals fall into two general categories: those that may be useful to your science, and those that may be useful to your management skills. Both are valuable. For building your science network, revisit your strategic plan. Are your immediate goals to get papers published? If so, meet with editors at meetings and get to know them. Discuss your findings to identify an appropriate journal. Get the community excited about your story by going to meetings. Science is about people, and if people know who you are and know your work, your name will come to mind when an opportunity arises. Travel and give talks. Look for occasions to speak in geographical areas you will be visiting. Don't be afraid to ask for opportunities. Let your colleagues know that you would love to visit. Send emails to see if there are speaking slots locally or even nationally. Navigate this process with sensitivity and care, but often as new PIs we need to knock to find doors that may open. Finally, it is important to acknowledge that this type of networking can be uncomfortable or even downright scary for many of us intro-

verts. Having a plan can be very helpful. Who at that next meeting would you like to talk to? Make a list, and then determine how you might arrange to meet these individuals. You can ask a colleague to introduce you or even set up formal or informal meetings on your own. Finally, decide what you're going to say. You can write down these thoughts and practice out loud. This can take much of the mystery and uncertainty out of these initial encounters and can help foster your ability to make professional connections.

In growing your managing skills, keep in mind that since almost no PIs have received formal training in leadership, business management, mentoring, etc., many of our mentors may not have the skills we seek. Fortunately, there is a wide world of management experts at your disposal. These individuals have made careers out of advising executives on a range of issues from strategic planning, to mentoring, to hiring, to networking, to brand management. Being open to these outside perspectives can help bring new and creative solutions to problems. It can also help set your lab apart as one that takes mentorship and leadership seriously. The other advantage is that since such advisors are outside academia, the new PI can feel at liberty to be completely honest about any issues without the potential of negatively impacting the perception of their colleagues. Finally, any advice they offer will be from a place of experience and expertise designed only with you and your lab in mind.

Manage Your Time

Time is a finite resource, and the flat management structure of most labs means that the PI's time quickly can become a bottleneck to productivity. In part this is because PIs can find themselves with many demands on their time: teaching, committees, institutional service, talks, meetings, writing, and travel—all of which can take time away from thinking about and managing the science and the lab. How can we navigate these many new demands? There are three common culprits to PI time drain. The first is saying "yes" when we should say "no." When you are asked to do something, evaluate whether it advances your strategic plan. If not, strongly consider no. To make this process easier, consider prewriting a few types of "no" emails that you can modify

when needed. This helps lessen the emotional burden of no. The second culprit is a lack of clearly defined goals. If priorities aren't defined, it becomes much more difficult to determine how many hours per day should be devoted to which tasks. By tackling strategic planning, you will then be able to budget your time in line with these goals. The third culprit is distractions. This can come in the form of well-meaning distractions (lab members or faculty swinging by to chat), less well-intentioned distractions (lab drama or institutional politics), or technology (email and phones). Learn to protect your productivity from these time thieves. Turn off email at designated times of the day, develop a kind but clear note for your door, and have some prepared sentences to considerately end conversations with when you need to get to work.

Manage Your Money

Like time, money is also a rate-limiting resource. Regardless of the startup package that you have negotiated, the money that you will receive to start your lab is finite. Since it is difficult to predict when additional grants may be funded, deciding when and how to spend your money can present a significant challenge. We suggest two strategies. The first may be obvious but it is nonetheless important: apply for grants early and often. Indeed, a number of grants that tend to have reduced requirements for preliminary data exist solely for new PIs. This "more shots on goal" approach (within reason) statistically increases the likelihood of funding. Second, plan your budget around your strategic scientific goals. What financial commitment is it going to take to achieve your short-term goals? Your long-term goals? How risk-averse or risk-tolerant are you? Do any goals need to be revised to better fund the lab? Identify options to maximize your lab dollars through collaboration, negotiating with companies when buying equipment, or helping to secure additional funding for your lab members through trainee grants. When hiring, consider the entire life cycle of the trainee salary and supply costs and the impact this will have on your budget. In addition, determine what significant non-salary costs your lab will incur (e.g., animal housing, sequencing, etc.) and design strategies to keep these costs in check. In these

calculations it can be helpful to partner with financial analyst administrators at your institution. Finally, designate a quarterly time to review your lab's finances and adjust your scientific, grant writing, and publishing goals based on these reviews. While money management is not the reason many of us entered science, it is vital to running a successful lab.

Final Thoughts

The job of a PI is one of incredible possibility and stunning joy. However, the first few years of PI-hood can also be among the more stressful years of a scientific career. As you progress, remember to savor this well-earned opportunity. Take

the time to do things in and out of the lab that give you energy and fulfillment so that the journey can be part of the fun. We hope that these tips will enable scientists to continue to find success, delight, and creativity in their roles as PIs that enable them to make discoveries and train mentees that change the world for the better.

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