On being an advisor to today's junior scientists

C. David Allis[a,1]

Young scientists often have the same long-term goal: use one's smarts and drive to gain insights into a problem of interest. Typically, these scientists draw upon a long-standing and time-tested scientific process: formulate a hypothesis, design experiments to test this hypothesis, collect data, interpret the data, revisit and modify the hypothesis, and so on.

Unfortunately, the reality isn't quite so straightforward. The hours are long and the rewards short. And the challenges for fledgling scientists seem to be growing. Attractive jobs are scarce, funding is tight at many levels, and the task of publishing a single study can be onerous.

These challenges combine to yield an intimidating set of high hurdles for the young group leader to surmount as he or she leaves the comfort of the postdoctorate (or graduate student) nest. Indeed, whereas all of these challenges existed at some level when I started a new assistant professorship, the ascent to success in science is much steeper now.

From my perch as a senior scientist, one who feels fortunate to have achieved this level of success, I see several crucial questions. Who should prepare graduate students or postdoctorates when it is time for them to move on? Whose job is it to make sure that their wings are strong enough to avoid a career crash landing? No doubt a fair percentage of this responsibility falls to the students and postdoctorates. But senior, well-established scientists must be part of a willing educational and training process that begins when we accept folks into our laboratories. Here I offer some ways advisors can assist young scientists to improve their lot, based on insights I've gleaned in the course of my career.

Scientist advisors should take pains to guide their protégés, ensuring they have every opportunity to succeed in this increasingly challenging profession. Image courtesy of Dave Cutler (artist).

[a]Laboratory of Chromatin Biology and Epigenetics, The Rockefeller University, New York, NY 10065

The author declares no conflict of interest.

Any opinions, findings, conclusions, or recommendations expressed in this work are those of the author and have not been endorsed by the National Academy of Sciences.

[1]Email: alliscd@rockefeller.edu.

Words of Encouragement

Publishing, the primary means by which scientists advance, has become a daunting task. When I was a young scientist, a single paper often contained five to seven figures; supplemental data did not exist. Now a paper in life sciences can have Herculean publication requirements—the need to gain insights into fundamental mechanisms, perform experiments in cell and animal models, and ideally, shed light on a human disease with therapeutic implications—all supported by reams of primary and supplemental data that can sum to several papers' worth of work.

Thirty-plus years ago, the scientific literature entailed only a handful of top journals accessed via periodic trips to the library when experiments were in progress or waiting for X-ray films to expose. The scientific literature today is vast and all of it easily accessible online. There is no longer any excuse to not read and know everything. Young scientists constantly face fierce competitive pressures from others studying the same problem.

As students, postdoctorates, and junior investigators move through our laboratories, or join junior faculty positions at our institutions, offering them positive support and encouragement is critically important.

Excelling only at the bench does not make a complete scientist; our job is to make sure the training we provide does not stop there.

I learned that even the best scientists, young or established, enjoy recognition from their peers and the occasional pat on the back, even if they have tasted scientific success. In my field of cell and molecular biology, and in many others, young researchers encounter a stark reality: the actual experiments often don't work. When I was at the bench, my most important samples seemed always to be the ones that got lost or ruined. Practicing scientists often experience the bittersweet truth that Murphy's Law is real.

Once the troubleshooting is done, finding the perfect set of figures for a publication can be difficult. Once submitted, the review process for papers (and grants) can be challenging and discouraging; those with thin skins are not well suited for this business. All of us have looked in the mirror at times asking, "Do I really need this?" Encouragement from a senior scientist can, as in the case of encouragement from a good teacher, help retain those who are well-suited to the profession. We may not be able to put passion into a young scientist, but we can strive to help them better gauge if this career is a good fit.

Skill Sets

What skills should senior scientists impart in hopes of advancing a protégé's career? Clearly, students and postdoctorates must learn to design and carry out decisive and well-controlled experiments. But this is only one part of their education. Learning how to write clear scientific papers and grant proposals is a must. Practice in writing can come in many forms. When needed, insisting upon written figure legends of data or writing summaries of laboratory meetings may give much-needed practice to a struggling student or postdoctorate. Asking only for the end product of a doctoral thesis or a postdoctorate fellowship proposal is not enough.

Papers penned solely by the advisor are missed opportunities; first drafts should come from the first author unless competitive pressures dictate otherwise. Similarly, grant writing is an excellent teaching opportunity that often involves subsets of my laboratory who are doing the bench work under the grant's umbrella. Papers and grant proposals will be a key part of the career of junior scientists who seek independence. Without being able to write well, the best experiments will not be appreciated or understood; funding will likely suffer. We need to be their science—and in some cases—English teachers. This is particularly important for individuals where English is not their native language. Additional classes for written and spoken English should be required for all who exhibit these deficiencies, even if this means fewer data are collected from them.

Even with English skills mastered, the art of good public speaking is increasingly critically important as individuals advance through their careers. Giving a great talk may come naturally to some, but most folks need repeated practice and coaching. Everything from having clear, well-labeled slides to learning how to tell a good story requires practice. "Know your audience," I've often advised. Once you lose that audience during your talk, you will never get them back. Try not to bore them or overload them with too many data-dense slides. I have rarely been offended by a speaker who "dumbs down" his or her talk, but some have lost me soon after they began. I enjoy practicing talks with my laboratory groups; the laboratory as a whole also profits immensely from these practice-talk laboratory meetings. The difference between the first and last practice talk can be striking and very educational. Learning how to tell a good story is well worth the effort, and is part of grooming people for success.

Outside of the Laboratory

Doing science is a human occupation, and scientists thrive when they engage in exchanges with other scientists. Besides laboratory events, encourage junior laboratory members to pursue local events— seminars, workshops, symposia, meetings, and so forth—and at some appropriate stage, expand this to having them attend regional, national, and international venues. Ideally, advisors should insist that their students and postdoctorates actually participate in the meeting, not just attend. Posters are an excellent start, but short platform talks are even better.

It's always good to practice with an audience of peers. If you make a mistake, ask a naïve question, or get stuck on an answer, you never forget that lump in your throat. Good scientists vow to never let it happen again. Reflecting on my own career, I have found that the more vocal, interactive laboratory members who actively participate in these settings often go on to

make better group leaders. Excelling only at the bench does not make a complete scientist; our job is to make sure the training we provide does not stop there.

Over the course of my career, collaborations have become increasingly key to research programs' success. Publishing papers with only a small handful of authors seems to be a thing of the past. Given this trend, empower your students and postdoctorates by having them actively participate in laboratory collaborations. As a general rule, I ask everyone in my group who is involved in a collaborative effort to join in on every relevant call or decision-making step (whether licensing a new reagent or tool from the laboratory, working out a provisional patent, or pitching a new antibody project to a company, and so forth).

At times, I have sent my folks to collaborator laboratories to learn new assays, or asked them to host and "coach" collaborators who visit my laboratory to learn a new approach. In some cases, these extra interactions have led to other, unexpected research or speaking opportunities for members of my group. For example, interactions such as these have sparked speaking opportunities at workshops and meetings, and these in turn to shared collaborative new grants. All of these activities contribute to another essential career asset: learning how to network with other scientists is important and should be taught by example. Just who are the "right" people with whom to interact and collaborate, and what is the best way to initiate—or to step away from—a collaboration?

Beyond Good Letters

As they embark on their independent careers searching for positions, students and postdoctorates need more than just a "good letter." This holds even if they have a strong collection of top-tier papers in their curriculum vitae. For those who do stick it out, I find that making targeted phone calls or sending extra emails to key contacts can make a difference to help get my top-most people a second look from a search committee reviewing a sea of well-qualified applicants. My goal here is a simple one: to help deserving laboratory members make it onto a "short list," ideally in a position about which they are genuinely excited.

After folks leave my laboratory, I, like many, enjoy watching them grow as independent investigators. Even after their departure, senior scientists can do more to help their protégés surmount barriers. This includes discussing with our postdoctorates what projects, if any, are appropriate for them to take away from our own laboratories. For me, competing against a former laboratory member is unacceptable and should be avoided at all costs.

I like to give my leaving postdoctorates considerable, sometimes complete freedom to continue projects that they spearheaded while in my group, ones that I have willingly chosen to stay away from. In a small number of cases, I have not only stepped back from an entire research area, but also allowed and facilitated the transfer of grant funds from my laboratory to the former laboratory member. More often, we have chosen to continue to collaborate on a particular problem area that interests both of us, only now as "equals." With any luck, this may lead to new collaborative papers between our groups.

What about authorship on papers that were initiated in my laboratory, or continued on jointly between our two laboratories? Usually, the science itself dictates who should be the first, middle, or last author. When there are close judgment calls, I have asked my former laboratory mates to consider that they be the senior author, even if this means that I am a middle author or, at times, just acknowledged. If such a collaborative study happens to be published as a high-profile paper in a top-tier journal, the paper and the associated "name recognition" from being the senior author will likely further jump-start a junior scientist's career. I view this as a good thing. Being visible as a senior author can trigger downstream seminar and meeting invitations, which may, in turn, trigger new research avenues or collaborations for them. We should all remember just how hard it was to be a new group leader starting out on our own, and how different today's world is.

Outside of publishing papers, senior scientists can help junior scientists in other ways. Many of us have been chairs or cochairs of conferences in our areas of interest. Scheduling "heavy-hitters" on the program is to be expected, but I would like to see more junior scientists (students, postdoctorates, and assistant professors) get floor time at key meetings. When we do get invited to a meeting, more of us should consider surrendering our talk time in the program to others climbing up the career ladder. Most of us get plenty of chances to give talks before our peers, and many of us have listened to fabulous talks given by young scientists. For these younger scientists, this is often a big deal, and they often work hard to deliver a talk that will not disappoint. The same goes for other invitations, such as review articles on a particular topic. Most of our curricula vitae are long enough that we can afford to do this.

I've hardly been the perfect mentor. But in recent years, I've seen in sharp contrast how the challenges for today's junior scientists are different and steeper than the ones I faced early in my career. Looking back, I have come to view the occupation of "doing science" much like a relay race. It relies on the hard work and dedication of past generations and advances through the hard work and dedication of future generations. A baton must be passed between these generations to ensure continued success. Helping young scientists succeed in today's science enterprise is a worthwhile investment and one in which we should all gladly participate. We need to be their advocate—and we need to make sure that no one drops the baton.