Cell

Lessons from a Recovering Academic

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The conversion of basic biology into new therapeutics requires scientific activities in both academia and industry. Successful drug discovery projects span disciplines, sectors, and institutions and tightly couple laboratory and clinical experiments. Here, Ehlers describes conceptions and misconceptions about how science is conducted in industry versus academia.

We live in an era of remarkable advances in both fundamental biology and biomedicine. Although traditional academic research and efforts to translate its findings into useful technologies and medicines have in the past largely been carried out in separate spheres, the boundaries between the two are becoming increasingly blurred. Lately, I have seen a growing interest among academic colleagues—young scientists, senior faculty, and physician scientists—in understanding what makes the biopharmaceutical industry tick and how science in an academic lab differs from biopharma. Here, I offer a field guide for academics who are curious about how drug discovery works, with my perspective on the similarities and differences between academia and industry and what to consider when transitioning from academia to industry.

Be the "Someone, Somewhere"

Why might someone want to consider moving from a career in academia to industry? It is true that most of the starting points for safe and effective medicines begin in basic biology emanating from academic laboratories, where molecular pathways, disease pathophysiology, cellular mechanisms, and therapeutic hypotheses often originate. These labs are really the only place where truly basic research is conducted, and I believe there is a great need to augment and encourage blue-sky and curiosity-driven research. No substitute exists for fundamental basic research in cracking open new realms of knowledge and uncovering the unexpected.

As great science revealing important new insights is conducted and written up in papers, the findings are often put in the context of potential therapeutic applications to accommodate the wishes of funding agencies, reviewers, and journals. The emphasis here is on the "potential" therapeutic application—by and large, most academic laboratories leave off describing how "someone, somewhere" might use those findings to create new therapies. While this produces a variety of interesting therapeutic hypotheses, it is just the beginning of therapeutic translation. It is, in a sense, the "bumper-sticker" approach to translational effort.

In fact, translation is more than attaching new labels to standard approaches that have potential clinical utility. Rather, it is the crucible where a deep understanding of underlying biological mechanisms gives rise to defined health care value and impact. In biopharma, translation means innovation combined with practicality to generate new medicines. While the "potential applications" are often where academics stop and turn to other pursuits, in industry, you actually become the someone, somewhere—your job is to push a therapeutic hypothesis out of the nest and see if it flies.

Debunking Common Myths

Prior to my move to industry, I had a number of concerns about what a career in industry would entail, what day-to-day pursuit of drug discovery would mean, and how science would differ between an academic setting and the industry setting with which I was only passingly familiar. I describe below some prominent myths about industry science that, in my experience, are not accurate.

Myth #1: An Uber-Committee Will Tell You What to Do

A frequent concern among academics is that their science will be determined by forceful edicts from a nebulous management organization telling them what to do. Some of this sentiment may come from the view that, in academia, investigators can pursue whatever project they want—provided they get funding to do it! This latter constraint can be quite significant and in fact produces very real boundary conditions to complete academic freedom.

In industry, the boundaries are typically drawn around a set of diseases, with the end goal of creating a meaningful therapeutic. There is a broad ability and latitude to pursue best approaches, pivot toward better options, and change projects. Granted, not all disease areas will be seen as big opportunities, but there is a large open space for creativity and selecting best mechanisms. Rather than writing a grant to persuade a funding body to support a line of research, industry scientists typically pursue projects that have been reviewed and selected by a group of scientists in the therapeutic area. In my experience, most of the best new projects have come from the ground up, proposed by more junior scientists and group leaders rather than a senior leadership team.

There can be, however, a difference between large and small biopharma. Large companies tend to pursue multiple diseases and therapeutic areas that can allow for a broader range of science. Small biotech is more typically focused on a specific molecular target, disease entity, or defined biological process, based on the intellectual property or proprietary molecules and technologies held by the company. However, even in a setting where the specific project goal is well-defined, there is seldom a standard approach or edicts from on high regarding the "hows" of actually achieving that goal.

Box 1. Acronym Soup

When joining industry, one may be required to file an IND, register an NME, calculate the eNPV, know the differences between the FDA and the EMA, optimize the cLogP, ensure high quality CMC, engineer your antibody CDRs, file a BLA or NDA, consult a KOL, identify the right CRO, generate IP that gives you FTO, operate under a CDA, run assays using GLP, make GMP material, have SOPs in place to avoid a 483, release a TLR, measure HCPs that contaminate the API, or make sure that an HCP (not the type that contaminates API) doesn't have a COI. Like any discipline, the biotech and pharmaceutical industry has its own terminology, replete with an alphabet soup of acronyms. It is very much like learning a new language, and portions of this language will be specific to a given company. So, brace yourself for a large set of new terms and jargon. Most companies will have committees, teams, or groups with names that themselves become acronyms, even to the point where the original acronym meaning is lost.

Myth #2: Industry Science Is Not Intellectually Challenging

"All the exciting and difficult biology is worked out in academic labs. In industry, aren't you just taking an assay and screening a small molecule or antibody library or working out details that follow naturally from a mechanism someone else found"? In other words, isn't it boring and formulaic?

In fact, there is a substantial intellectual challenge in selecting disease areas and mechanisms in the first place among the many that one could work on. Becoming a discerning drug discovery scientist, able to sniff out a biological pathway that is tractable and central to changing disease pathophysiology amid the considerable background noise of published findings, is absolutely critical. Designing kill-shot experiments that will quickly refute or support a given hypothesis, weeding out other possibilities to illuminate the path from an early discovery program to the clinic, engaging with all the disciplines required to convert a biological hypothesis into a molecule with the right properties, and executing clinical studies in a way that maintains rigorous experimental methodology and allows for meaningful conclusions are all areas that require experience, intuition, and deep intellectual rigor.

Drug discovery is remarkably synthetic, requiring one to draw strands of knowledge, technical insight, and practical savvy from biology, chemistry, pharmacology, clinical medicine, and regulatory science, coupled with an understanding of the patient and commercial landscape. It is an understatement to say that I have learned ten times as much in my 6 years in industry than I did in my 12 years running an academic laboratory. This steep learning curve is a common feature for academics joining industry at any level. When I moved to industry, it was the first time in my career that I felt like I really needed to utilize the full breadth of my scientific skills and training.

Myth #3: Industry Science Is Just an Assembly Line

In industry, many elements of biomedical research can be pursued to scale, whether we are talking about large-scale molecule screens, animal studies, or clinical trials at dozens of sites across the globe. The many disciplines brought to bear around a project can lead to a view that scientists are simply technical staff, expert in a given assay or step in the process. But the "Henry Ford" view of biopharma is not accurate. Perhaps most importantly, there is no one recipe to make a medicine, meaning that any attempt at a formulaic assembly line for all drugs would be doomed to failure. Creativity abounds at every step of the process, whether the most fundamental biology, the medicinal chemistry design, the manufacturing processes for producing a complex biologic agent, or novel clinical assessment technologies. Drug discovery requires substantial collaboration and communication that cuts across disciplines. The most successful individual scientists are those who understand many facets, not those who limit themselves to working as one cog in a giant machine.

Myth #4: A Move to Industry Is a One-Way Street

This is the "roach motel" theory of a move to industry: namely, once you move in, you can never move out. This perspective may have been more accurate 15 or more years ago when industry science was often conducted at insular, monolithic campuses apart from bioinnovation centers and prior to the advancing small biotech sector. However, more and more, I see all players in the biomedical ecosystem coming together, whether it is academic investigators spinning out companies or moving to industry, academic institutions setting up drug discovery efforts internally, or companies establishing academic collaboration networks.

Indeed, many scientists that gain industry experience become highly sought-after in academic positions as faculty or senior leaders. During my time in industry, I have seen scientists leave industry to join or re-enter academia as faculty, and I have sensed increasing interest at academic institutions for senior scientists, faculty, and institutional leaders with industry experience. Additionally, academia can be a haven for individuals coming out of industry who find an area of science that they want to pursue in-depth, less oriented toward therapeutic discovery. At more junior levels, young scientists with industry experience are often the most sought-after and successful graduate students. I expect the multilateral movement between academic institutions, biotech, and large biopharma to only increase in the future.

A Basic Blueprint to the Black Box

With those misconceptions now set aside, what does the process of drug discovery actually look like (Box 1)? From the outside, how projects are initiated and advanced in industry may appear mysterious, but the general framework is usually the same from one project to another. Starting out, it is quite common for a small group of lab scientists to formulate an idea for a new drug target or pathway that could constitute a new program. In this very early stage of drug discovery, the scientists must typically conduct extensive literature reviews, evaluate known (particularly human) data that support the hypothesis, and identify any findings or potential experiments that would "kill" the program to ensure that rigorous experiments are carried out early on in the project. If the scientists are confident in their new idea or target, they typically present a proposal to senior leadership, who will evaluate it in terms of potential impact on disease, feasibility as a drug target,

match to unmet medical need, and competitive positioning relative to drugs that already exist or are in the pipelines of other companies. From this consideration will typically come a decision regarding whether or not to allow entry into the portfolio. If successful, other disciplines will assign people and resources to support a project plan.

Later in the life cycle of a program, when a team has—or nearly has—a specific clinical candidate compound in hand, the team and research project lead often have to go to a central body to receive funds for initial preparation and conduct of clinical studies. This is where much larger sums of money come in: the central body typically manages a budget that they allocate across many different clinical programs and therapeutic areas, so they are tasked with assessing where the best opportunity lies.

Most therapeutic areas (e.g., oncology, neuroscience, or inflammation) will have a therapeutic area head and leadership team that determines whether programs enter, stay, or exit the portfolio of projects being run by that therapeutic area. For decisions that sit above a therapeutic area, there is often a small group of senior drug discovery and development experts examining the details across all programs. It is here that broader company strategy plays out. For example, is oncology more attractive than metabolic disease for a company? Is there internal expertise capable of supporting one area or program better than another? Are there considerations in maintaining clinical, commercial, or scientific presence in a given area?

Four Dimensions of Successful Drug Discovery

When approaching a drug discovery and development program, industry scientists must consider four key dimensions. The first, and most critical, dimension is *efficacy*. Put simply, the drug needs to work. Efficacy is all about the molecular target, the biological mechanism, and its impact on disease pathophysiology. Does manipulation of the target in the desired manner reverse disease course, restore function, delay progression, or even cure the disease?

Efficacy is the most familiar dimension for academic scientists to relate to, but it is only one factor that industry scientists must consider. The second dimension is *safety*. A drug must not only directly impact disease pathophysiology, but also must be safe for a patient. A scientific approach to safety requires an understanding of the action of a drug and the targeted pathway in physiological systems *outside* those impacted in the disease state. For example, if a promising ion channel modulator for epilepsy or depression is also expressed in the sinoatrial node of the heart and alters cardiac rhythm, that is unlikely to be a new medicine. Drugs must be as selective as possible for target organs and tissues, and any effects outside the target tissue must be investigated, dissected, and understood.

The third dimension is *superiority*. Increasingly, drug approval requires head-to-head clinical testing relative to the current standard of care, meaning the current drug or therapeutic avenue in common use. In Europe, such comparative studies are generally required for approval. A drug discovery program must consider how a given biological mechanism will operate relative to, or as an adjunct to, those drugs currently in use. For example, any new medicine for schizophrenia will be judged in the context of chronic antipsychotic use. As another example, the widespread use of statin drugs to lower low-density lipoprotein (LDL) cholesterol means that the underlying physiology is quite different than the native state. Indeed, pathological evidence indicates that the nature of atherosclerotic plaques is changing across the patient population, likely due to the prevalence of statin use. Any new medicine in this area of cardiovascular disease would need to be considered mechanistically in the setting of chronic statin use. Development of new drugs for autoimmune disorders such as rheumatoid arthritis must consider how the targeted biology interfaces with dihydrofolate reductase (DHFR) inhibition by methotrexate, as it is a common first line treatment. This dimension of superiority is seldom considered in academic research but is essential to drug discovery scientists.

The fourth dimension is *value* or *cost offset*, the importance of which is steadily increasing. Even if a drug works, is safe, and is better than the current standard of care, it may or may not be reimbursed by insurance companies or national health systems depending on cost-benefit analyses. Thus, ensuring patient access to a new medicine requires consideration of overall medical benefit and the costs that a new drug will offset in other parts of the medical system. For example, is it likely that use of a new innovative drug will reduce hospitalizations, procedures, interventions, or other

drivers of significant health-system cost? Drug discovery teams have to consider this economic dimension in order to have a clear view of unmet medical need and how a new therapeutic hypothesis would benefit patients. Whenever possible, experiments (particularly clinical experiments) must be designed that can prove the medical benefit in a way that also defrays health-care costs otherwise incurred.

A Broad Education

For those considering a transition from academia to industry, it is useful to consider how the knowledge base needed for the two can differ. Academic research emphasizes depth on a given topic. Today, Ph.D. training becomes very specialized very early, and to crack open new biology, there is no substitute for deep expertise. But the challenges inherent to drug discovery are not the same as those encountered in academic research. Biology is but one core discipline (albeit, arguably, the most important) represented on a drug discovery team, which encompasses a broad scope of knowledge.

Success in industry requires an awareness of medicinal chemistry, protein engineering, assay development, regulatory science, and more. These are but a few of the kinds of questions that one lives and breathes in a drug discovery setting: what is the desired impact of an agent that addresses the therapeutic hypothesis posed by a given drug discovery program? Do you want to have a therapeutic agent that is orally bioavailable or delivered by subcutaneous injection? Is there a need for continuous or periodic engagement of a molecular target? How does the drug impact other cells and tissues that are not part of the primary disease? What assay would be best to screen for a desired activity? How will you measure the drug effect in patients? Is production of the drug scalable and manufacturable? Will the drug be administered with other drugs in a clinical setting where the biology and pharmacology will interact?

I have often been asked whether my medical degree has helped me in conducting drug discovery science in industry. The answer is, unequivocally, "yes." There are tremendous advantages to understanding a breadth of disease states, directly interfacing with patients, and knowing diverse organ systems' physiology, histology, pathology, and pharmacology. You may find yourself as a molecular biologist working in oncology being confronted by very complicated immunology, safety toxicology producing renal damage, or cardiac QTc prolongation. You may be a neuroscientist who needs to understand small molecule gut absorption, first-pass hepatic metabolism, or surfactant production in the lung. Like it or not, it's a good idea to break out those med school textbooks (or web courses), think of the whole organism, and immerse oneself in the medical science and practice relevant to the projects one works on in industry.

Success in industry also requires deep, rigorous knowledge of pharmacology, including pharmacokinetics, dose-exposure-response relationships, and modeling. Increasingly, systems pharmacology is deployed to develop quantitative models defining the relationship between disease pathophysiology, drug action, and variability among individuals. With the advent of biologics (i.e., monoclonal antibodies, peptides, proteins, and oligonucleotides) as therapeutics, new areas of large molecule pharmacokinetics and metabolism sciences are rapidly developing. Unfortunately, pharmacology is one of the biggest knowledge gaps in scientists who move to industry. It is disappointingly rare to find biomedical scientists able to define or calculate Hill coefficients, to clearly describe orthosteric versus allosteric drug action, to fully understand the need for free tissue concentrations of drug to interpret in vivo dose-effect findings, or to know the major pathways of drug metabolism. Incompletely rigorous pharmacology is often the source of misinterpretation or non-reproducibility in the literature. This manifests as studies without a dose response, where target occupancy is not measured or known, or where the free drug exposure in a target tissue is unknown or inappropriate. These topics must become second nature for one to be a top-flight drug hunter.

Industry does provide some ability to learn on the job (and thank goodness, as I look back and realize how little I knew before moving to industry). Junior scientists entering industry are expected to show mastery of a defined discipline or disciplines, and their expertise should grow to expand into other aspects of drug discovery. Group leaders or people in more senior positions must be able to (in short order) design and run more fully integrated programs, with knowledge across relevant disciplines. A successful move to industry requires voracious curiosity in many fields and dimensions.

Communication Is Key

Despite the intellectual challenges I have painted for individual industry scientists, medicines are, of course, not born in isolation. It takes a village—indeed, a metropolis. This is not science conducted alone in the ivory tower or a single laboratory but rather organized by teams in the bustling marketplace. Project teams consist of members from multiple disciplines, and more than one lab can be part of the same project. Members may include biologists, chemists, protein engineers, drug-safety scientists, distribution metabolism pharmacokinetics (DMPK) scientists, clinicians, geneticists, clinical pharmacologists, pharmaceutical scientists, regulatory scientists, commercial colleagues, and more, with the team composition changing as a project advances.

Much attention in the academic career path has been given to the need to train future investigators in the discipline and art of lab management. Mentoring students and postdocs, directing laboratory staff, interfacing effectively with faculty colleagues, and managing lab administration are all part of running a successful academic laboratory. In industry, these management features are even more prominent. Projects are not held by individuals but rather span many groups in many locations. Deadlines and deliverables are concrete, and project milestones are tracked with high expectations. You need to understand the relevant stakeholders required to move a project forward and effectively marshal your resources. Importantly, a good portion of the science in industry is conducted through third parties including contract research organizations, academic collaborators, and consortia. A crucial skill for industry scientists at all levels is to recognize what functions or experiments need to be conducted inside

the company and what can be sourced externally.

One of the biggest keys to success in industry is the ability to communicate effectively, both in writing and speaking, and to tailor a message to the audience, which could be fellow scientists, commercial colleagues, investors, or patient groups. In "shark tank"-like venues, a crisp, clear scientific pitch can make or break support for a program. Furthermore, the team sport of drug discovery requires nimble communication within the team as balls are passed, plays are called, and adjustments are made in real time.

Moving from "Me" to "Us"

While academia sometimes encourages collaboration between labs or institutions, large multidisciplinary teams are the general rule in industry. There is less autonomy in setting one's agenda: the requirements of a project team, deadlines, and milestones necessitate group goals. Not all time is your own. This conduct of team-oriented projects is one of the biggest differences compared to academic research, where projects are more individual oriented. Both models allow for glory and achievement but in distinct ways.

In academia, success requires being first author or last author on the paper or primary investigator on the grant. Individuals less inclined to jockey for these positions will likely have a shortened or less-successful academic career. I have found that it can be difficult initially for academic-turned-industry scientists to move away from this individual focus, which the academic career trajectory naturally selects for. In my own experience, stepping away from this element of academic culture was liberating, as it let me focus solely on the science and project advancement. It no longer matters whether a given experiment is done by one lab or another, published 6 months before a competing laboratory, or conducted internally in a company or externally by collaborators who themselves might want to publish the findings. The goal is to access and advance science that matters for us to discover and design new medicines.

For scientists who like working and being part of a team, where individual recognition matters less than group and project success, industry science can be a very welcome change. However, for scientists with a laser focus on pursuit of their individual passion and curiosity, industry research can require too much consensus building and dependence on others.

Humility Helps—It Isn't Easy

Most academics become the world expert in their focused area of research, knowing more than any other person about a specific topic or discipline. This naturally leads to deep insight into a field and confidence of one's knowledge within a circumscribed sphere. When I entered industry, I found my deep knowledge of neuronal cell biology to be very helpful and a foundation upon which to build further drug discovery expertise. But for those transitioning to industry from this position, it is also important to recognize all that you don't know and to approach the challenge of drug discovery and development with humility, because it is a daunting challenge.

In my case, I had served on various scientific advisory panels advising company R&D groups as a so-called key opinion leader or KOL. Then I joined industry myself, and I came away humbled by my limited appreciation of drug discovery and real-world translational science. I was certainly familiar with the underlying mechanisms of action being worked on, the biological pathways, and the therapeutic hypotheses. But I really had little knowledge of how to convert a biological measurement into a robust high throughput screen, how to identify quality small or large molecules in terms of their physical properties or bioavailability, how to crisply conceive "go/no-go" experiments, or how to conduct a clinical trial, to name but a few. In the ensuing years, I have spent considerable time and effort to learn about each of these areas and more. While moving up the learning curve, be prepared for the steepness of the learning curve and embrace the knowledge synthesis.

Experimental Rigor

In an academic setting, a premium is placed on novelty and unexpected findings that open new horizons. This necessarily means that experiments operate at the boundaries of knowledge in a more exploratory fashion, and the focus is on being the first to break new ground.

In industry, a premium is placed on robustness of a finding. This dynamic, and the exponential cost increase as a drug development program progresses, requires experimental rigor at the earliest stages to avoid costly late-stage failure. Preclinical studies of significance typically initiate with a statistical analysis to determine appropriate powering, prespecified endpoints, and decision rules. Clinical studies often incorporate considerable variability in the studied population and the endpoints utilized (e.g., quality of life measures or general clinical scales), in which only truly strong, unmistakable biological effects on disease will be detectable. Thus, we need to know with high certainty that our data are real and robust at every stage. To ensure this, most key studies conducted internally or externally will be repeated and validated.

The primacy of robustness over novelty in industry science is a subtle but important distinction. I have found industry's high bar for rigorous conduct of the experimental method to be quite stimulating and gratifying. It keeps me close to the data and study design and means that data win the day.

Learning to Stop Projects

A general feature of academic research is the sustained commitment to a given topic, area, pathway, or biological process. It is through intense, durable, and concentrated effort that difficult and deep insight is obtained. This often means pursuing a single project or finding for years or decades. An academic researcher can readily and productively dedicate a career to the study of a specific protein, receptor, enzyme, or channel in an effort to understand its function. That pursuit may go in different directions—different physiology, different disease biology—but all along the way, it opens up new mechanistic insight.

In contrast, for an industry researcher, the path of research must have directionality: it must ultimately lead to a new medicine. Because every project has an opportunity cost, in that other projects are not being pursued, industry scientists must continuously evaluate whether any

given project has more promise to lead to a new drug. For example, a drug discovery team may be working on an exciting enzyme variant with therapeutic potential in chronic pain with years of cool biology, novel compounds, and defined pathways. However, if it becomes clear that the enzyme variant has species-specific expression in human podocytes with impact on kidney function, then chances are quite low that pharmacological modulation would ever have the safety profile required to make a medicine.

Substantial literature indicates that too many drug discovery programs fail at late stages despite the presence of evidence that could have rationally led to termination earlier. Why does this matter? As drug discovery programs advance to screening, identification of initial lead compounds, clinical candidate selection, and on into clinical trials, the cost soars. Even the smallest phase 2 clinical study in patients will be millions to tens of millions of dollars, with phase 3 programs readily costing hundreds of millions of dollars each. Thus, any indication that a program, a molecular target or mechanism, or a specific molecule is unlikely to profoundly impact disease in a safe, tolerable, and superior fashion should be used as a basis to stop the program. It is incumbent on the scientific teams to stand down at these points. Typically, at larger companies, those people and associated resources are then redeployed to more promising programs.

It is hard to step away from exciting science revealing new biology. So much effort, heart, soul, and money goes into making molecules that are suitable for testing in humans that it is a disappointment when, despite best efforts, a clinical hypothesis is refuted. Just as a given project in an academic lab will be near and dear to the student, postdoc, and PI and is a let-down if it doesn't work, failure of an experimental drug represents a great deal of intellectual effort, hard work, and commitment from a large number of people (though it is worth noting that definitive negative data are the second-best outcome in industry).

But, quite simply, the applied science mindset of industry requires shifting one's goals from making new discoveries to making new medicines. This balance, between sensing real drug opportunity and knowing when to step away, creates a skilled drug discovery scientist. It requires experience, knowledge that cuts across many disciplines, and a vision for discovery and development stages that helps you predict (and ideally avoid) the many pitfalls.

Being "Change Agile"

The biopharma industry is incredibly dynamic. Small companies come and go. Large companies can change priorities, merge, or split. Many segments of the investor community seek quick returns. All of these events surround scientific programs that can take a decade or more to bring to fruition. One will commonly have multiple managers over the course of a few years in industry, working on some projects that will persist to the clinic and to patients, while far more fall away.

With this backdrop, a frequent concern for scientists making a transition from academia to industry is the absence of job security. In academia, one usually anticipates having roughly the same job (as a faculty member) with the prospect for a couple of promotions over one's career. There is substantial continuity in a research program that can last for 30 or 40 years, and the prospect or fact of having tenure looms large as a major attraction for many academic researchers.

I have been frequently asked why I would give up a tenured position for an industry job that could change at any moment. What I have found is that, for scientists with strong experience and accomplishments in both an academic and industry setting, the palette of opportunities only gets larger. These scientists may have less security in any one job, but they gain security for an overall career. Industry scientists are most successful when they are able to adapt quickly, master diverse fields and technologies, cut across disciplines, and identify new opportunities before others. This is all captured by one of my favorite, highly corporate, terms—being "change agile."

The fast-paced tempo in industry can come at the cost of much-needed time dedicated to developing deep knowledge in an area, however. It is important for scientists in industry to resist the temptation to cycle from meeting to meeting, superficially surf abstracts at the expense of deep knowledge, and define "accomplishment" as attending yet another set of discussions. Rather, success requires staying rooted in experiments, data, the laboratory, and the literature.

Passion for Making Medicines

Plainly, great science is conducted in both academia and industry. The day-to-day thrills of conducting an experiment and seeing data for the first time are no different. An overarching motivational umbrella that encompasses a good portion of both academic and industry science is the desire to make a difference through discovery. In industry, this desire to make a difference must be focused on the discovery of that magical miracle of an innovative new medicine—a molecule whose properties and action can change lives. I marvel at every new medicine that reaches patients, knowing the amazing series of events that had to align to reach that point. Every new drug has behind it an epic tale of insight, risk, unexpected findings, perseverance, discovery, hope, disappointment, and triumph.

A passion for making new medicines is a central guiding light for scientists in industry. Curiosity, creativity, and wanting to know how things work are necessary, but not sufficient. Inspiration really must come from achieving the horizon goal—so scientists considering a move to industry must ascertain their own passion for applying science to making medicines.

Go Forth!

Much like the miraculous and winding path of a new medicine, career paths in industry are diverse and changing, stimulating in their scope, and challenging in their depth. For me, the journey from a basic science academic researcher to an industry scientist has felt like going from being a cheering spectator to being in the center of the arena in drug discovery. Maximizing the impact of the biology revolution on human health will require forging strong connections between science and scientists that span academia to industry and more people to adeptly straddle the two sectors.