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Nothing to lose: why early career scientists make ideal entrepreneurs

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An entrepreneurial movement within science strives to invert the classical trajectory of academic research careers by positioning trainees at the apex of burgeoning industries. Young scientists today have nothing to lose and everything to gain by pursuing this 'third road', and academic institutes and established companies only stand to benefit from supporting this emerging movement of discovery research with economic purpose.

Nothing to lose

The increasingly limited career prospects at academic institutes due to a fundamental lack of basic research funding and overwhelming excess of talent has resulted in a cheap surplus of young, accomplished, risk-inclined, hard-working, independent team leaders with only a cursory appreciation of their real market value. This is a near limitless resource of paradigm-changing intellectual property, including individuals who are willing to walk through walls to see their innovations through.

This is why graduate students and postdocs are the perfect entrepreneurs.

For starters, early career scientists have nothing to lose. Graduate school salaries pay next to nothing and post-doc salaries are only marginally better. Compared to their peers in engineering, law, medicine, or business administration, post-doctoral fellows languish at the bottom of the salary scale. In the United States and Canada, typical post-doctoral salaries begin at $38 000 USD per year and cap out at ~$50 000 USD per year. By comparison, early career physicians and lawyers, who have a comparable level of training, earn at least $70 000 to start. Within the basic sciences, academic salaries average 40% lower than those in industry, and at an average of ≥50 h per week, this amounts to roughly $14.50 USD per h; this is lower than a starting hourly laboratory technician salary in most academic research labs.

Career advancement prospects are also exceedingly poor. Only 15% of academics today, and fewer than 10% of entering PhD students, will be promoted to tenure-track academic positions within 6 years of completing their PhD (Figure 1). Despite all evidence to the contrary, 72% of trainees expect to be principal investigators in academia, and 92% of trainees expect to pursue a research-focused career path [1] (Figure 2).

If academia represents intellectual freedom and independence, and industry represents job security and earning potential, then for those capable and willing to pave their own way, entrepreneurship is the best of both worlds. Unlike a traditional academic career, entrepreneurship imposes no rigid promotion structure, no cap on career advancement or flexibility, and no inherent administrative limits on fundraising, hiring, or compensation. By effectively starting from scratch, new companies also bypass the bloated administrative programs that have become synonymous with larger academic institutions, while their often severe budgetary constraints promote leaner business practices that help reduce indirect costs and ensure all costs are directed entirely to advancing the scientific proposal.

This gray space between the traditional definitions of 'academia' and 'industry' is increasingly becoming an epicenter of innovation and new growth as federal governments become less able or willing to fund basic research, and new ways of developing necessary scientific discoveries are being charted. By definition, a biotech start-up requires scientists to frame scientific discovery in the context of a marketable product. There is no more 'translational' research than this, which epitomizes the bench to bedside approach, by requiring new, untested, and therefore, risky science to be pragmatically developed within the confines of an evolving, lean commercialization strategy. Entrepreneurial science, therefore, mandates a reimagining of what constitutes basic research, how we measure scientific progress, and when we declare success by tying research funding directly to future real-world application within timeframes on the order of 3–5 years (much shorter than academic research, but longer than most industry programs). It is not meant to replace historic academic institutions, but complement them, whilst bridging the divide between academic research institutes and established biotech and pharmaceutical companies.

Although translational science is an increasingly attractive vehicle for career development and scientific progress in theory, in practice, it comes at an exorbitant up-front price. The linchpin to a successful venture is the scientist–entrepreneur (and by extension, their team) whose career, idealism, and drive must be invested fully into trailblazing industry-creating research at the initial expense of security, infrastructure, and pay. It is a daunting value proposition with which graduate students and post-docs are already well acquainted, and for which they are, therefore,

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0968-0004/
 http://dx.doi.org/10.1016/j.tibs.2014.09.006

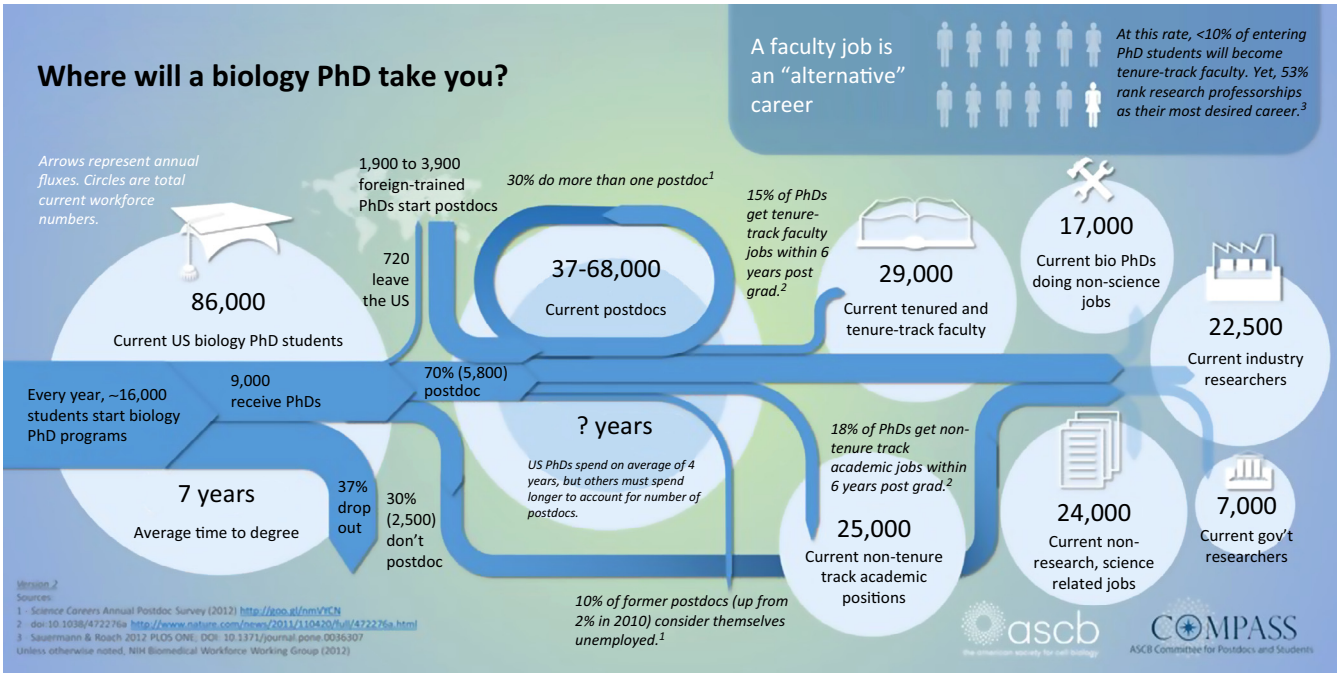

Figure 1. Academic career prospects in biology are poor. Only 15% of academics today, and fewer than 10% of entering PhD students, will be promoted to tenure-track academic positions within 6 years of completing their PhD Adapted, with permission, from the ASCB Post, 2014.

ideally suited. To call entrepreneurship high-risk/high-gain is an understatement, and the argument for early career scientists to pursue this career trajectory, and for academia and industry to support it, follows.

Why early career scientists should embrace entrepreneurship

With nothing to lose but poor pay, dismal advancement prospects, and shaky job security, graduate students and postdocs have everything to gain by engaging in new business start-ups. Trainees at this stage in their education and career are simultaneously at their most productive and committed. Insurmountable odds, repeated failure, and long horizons are something most academic researchers necessarily become extremely comfortable with, particularly in science. Their current job, while temporary, is stable (at least for the 2–3-year stretch afforded by most research grants), and sufficiently flexible to let the budding scientist–entrepreneur take business classes and do the necessary leg work to see their new ventures through. Most

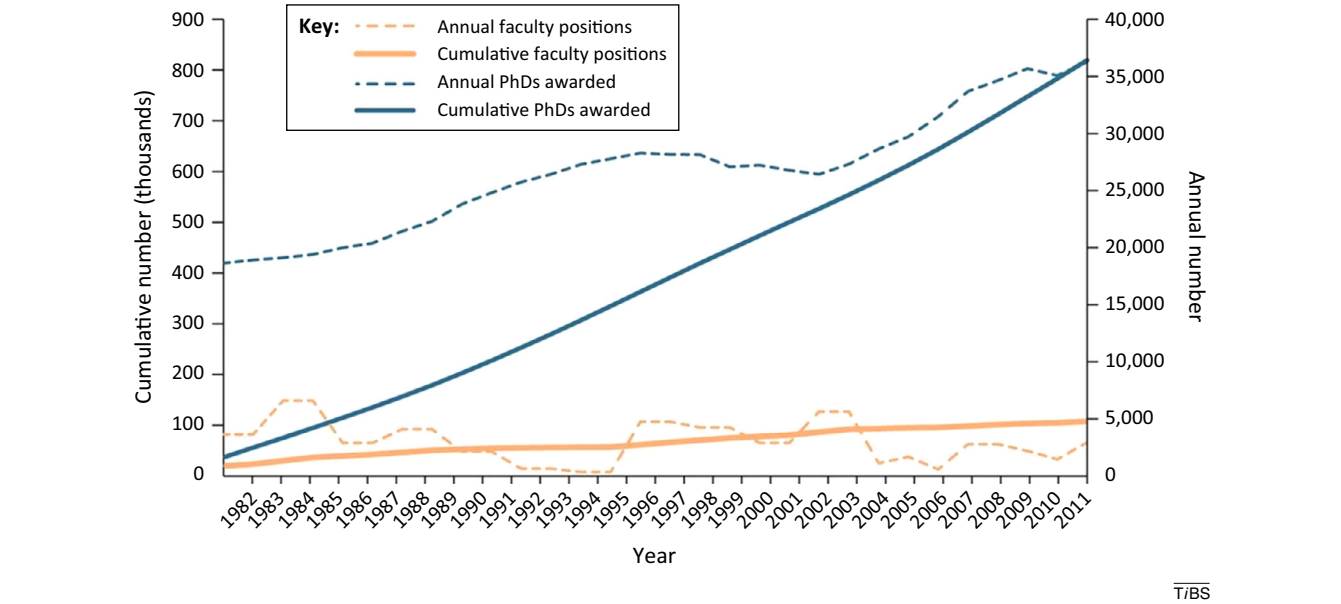

Figure 2. There are insufficient academic faculty positions to absorb our PhDs. The cumulative number of PhDs awarded greatly surmount the cumulative number of academic faculty positions available by nearly an order of magnitude. Adapted, with permission, from [2].

importantly, the skill set that they acquire in graduate school is entirely transferrable to the boardroom, and exactly what is required of a new CEO or CSO in the early stages of a company. Academics, by definition, are intellectual property-generating machines: grant applications are business plans, seminars are business pitches, and the competencies developed in managing personnel, accommodating budgetary requirements, establishing and negotiating collaborations, and meeting deadlines are all directly transferable to the business sector. The remainder can be learned 'on-the-job'. Indeed, most biotech and pharmaceutical investors expect to see scientific founders join their companies full time to help see them through their initial birthing pains and grow into profitable ventures. While the prospect of learning as you go can be daunting, it is certainly no more challenging than graduate school. Indeed, the proven ability to identify a market gap and spearhead a research plan with a small team, limited resources, and little direction despite paralyzing odds and overwhelming competition is the hallmark of a PhD thesis.

How to support entrepreneurship in science

Because graduate science programs exclusively train academics, there is a steep learning curve that needs to be made up by aspiring scientist–entrepreneurs who typically lack formal training in business. To bridge this education gap, business accelerators have very recently begun to pop up. For those unfamiliar with how accelerators work, admission into accelerator programs is usually coupled to business competitions. Participants are given access to networking opportunities, keynote speakers, industry leaders, and seminar series' on intellectual property management, regulatory approval, accounting and financing, team structure and management, commercialization strategy, pitch development, and marketing. Besides constituting a source of early funding, the process of taking a research project through the exercise of privatization is an incredible learning experience that exposes young scientists to career trajectories outside the narrow focus of 'university professor' or 'research scientist level III,' such as intellectual property law, venture capital, management and/or strategy consulting, research contract organizations, company and industry analysis, regulatory consultancy and science policy. These contacts open doors to careers most scientists do not know exist, but to which they are ideally suited.

Approaches to accelerator programs are varied, and examples include directed courses such as Harvard Business School's 'Commercializing Science' class (http://www.hbs.edu/coursecatalog/2107.html), foundations such as the Kauffman Foundation for Enterprise (http://www.kauffmanlabs.org/), business competitions and incubator space such as MassChallenge (http://masschallenge.org/), public–private partnerships such as MassCONNECT (http://www.massbio.org/innovation/massconnect), MARs (http://www.marsdd.com/), and the Centre for Commercialization of Regenerative Medicine (http://ccrm.ca/), and start-up laboratory space such as the Venture Development Center at the University of Massachusetts (http://www.umb.edu/vdc) and LabCentral (http://labcentral.org/). There are certainly more examples out there than these, and as the idea of entrepreneurship as a primary driver of economic growth continues to take hold, we should expect many more.

Concluding remarks

Entrepreneurship as a movement will live or die by our ability to sling-shot willing young professionals into independent high-risk/high-gain ventures that levy low-pay, exorbitant risk, and ridiculous hours in exchange for self-reliance, intellectual freedom, greater stability, and significantly higher earning potential. For better or worse, we have created in our early-career scientists a class of highly-educated cheap labor with poor career prospects and no safety net who have, nevertheless, been taught to think big, work independently, and believe whole-heartedly in the promise of scientific innovation apart from any prospect of financial compensation. By making entrepreneurship an accessible 'third road' to career advancement in science, young scientists with nothing to lose have everything to gain.

Acknowledgments

This work was supported in part by the National Institutes of Health grant 1K99HL114719-01A1 (J.N.T).

Disclaimer statement

J.N.T is a founder of, and has financial interest in, Platelet BioGenesis, a company that aims to produce donor-independent human platelets from human induced pluripotent stem cells at scale. J.N.T. is an inventor on this I.P. J.N.T.'s interests were reviewed and are managed by the Brigham and Women's Hospital and Partners HealthCare in accordance with their conflict of interest policies.

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